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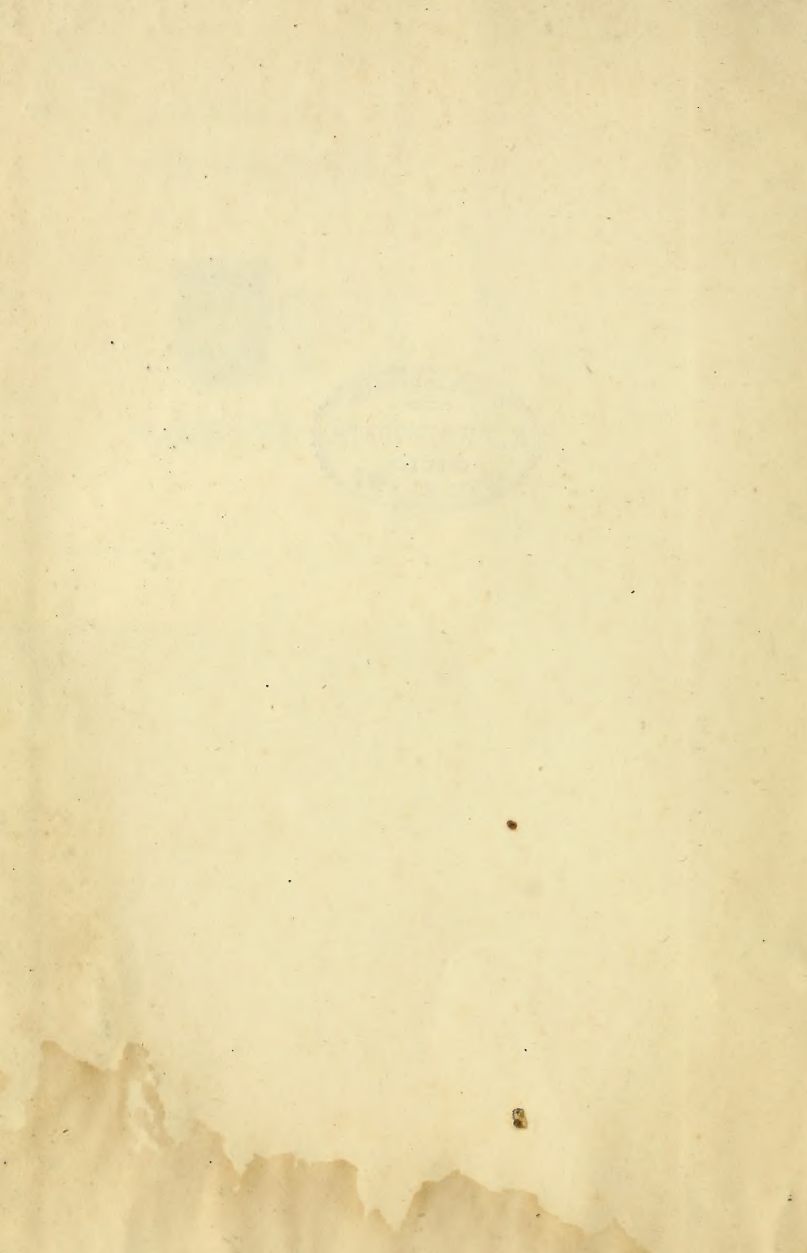
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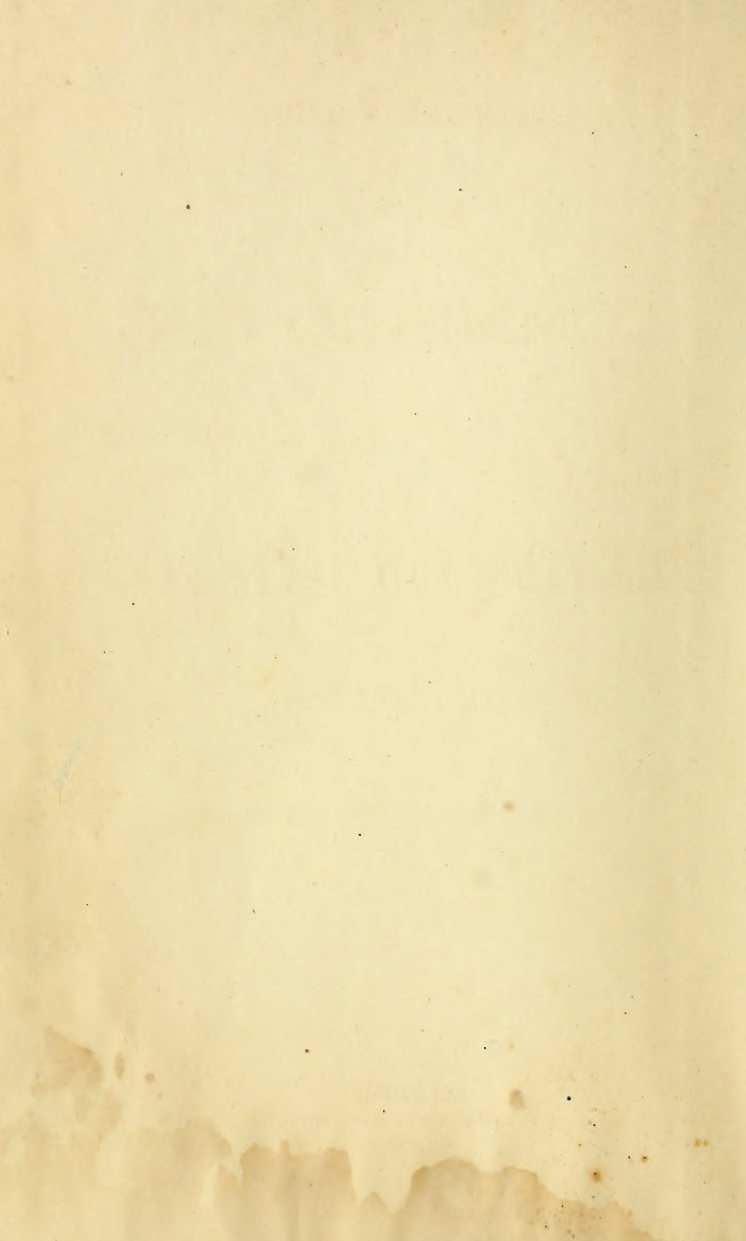
REPORT OF THE  
COMMISSIONER  
OF THE GENERAL LAND OFFICE

RELATIONS AND TELEGRAPH

OF THE

LAND OFFICE





ANNUAL REPORT

OF THE

COMMISSIONER

OF

RAILROADS AND TELEGRAPHS

OF OHIO,

FOR THE YEAR ENDING JUNE 30, 1881.

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COLUMBUS:  
G. J. BRAND & CO., STATE PRINTERS.  
1882.

REPORT

# COMMISSIONER

RABBITTS AND OTHERS

REPORT

THE UNITED STATES OF AMERICA



STATE OF OHIO, OFFICE OF COMMISSIONER OF RAILROADS AND TELEGRAPHS,  
COLUMBUS, *January 1, 1882.*

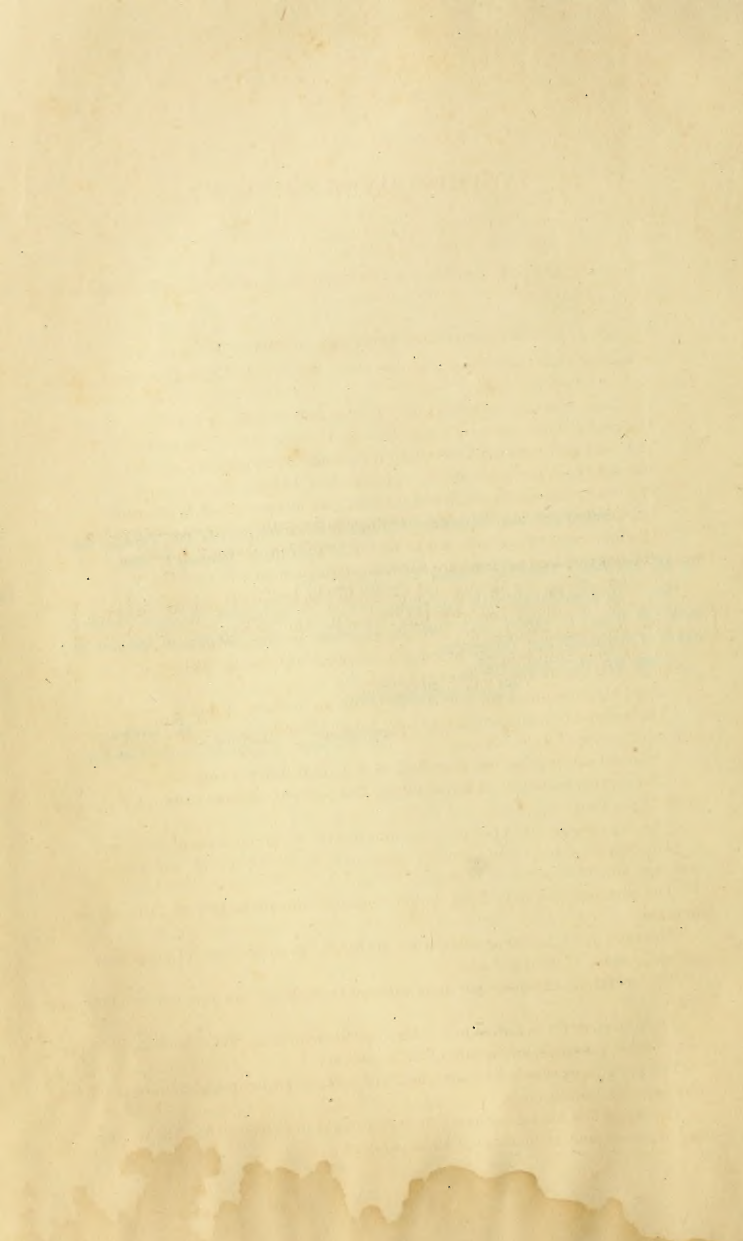
*To His Excellency, CHARLES FOSTER, Governor of Ohio:*

SIR: In accordance with the requirements of Section 264, Revised Statutes, I have the honor to submit herewith the Fifteenth Annual Report of the Commissioner of Railroads and Telegraphs.

I am, sir, very respectfully,

Your obedient servant,

H. SABINE,  
*Commissioner of Railroads and Telegraphs.*



## COMMISSIONER'S REPORT.

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Reports from 73 different roads have been received, which show the following results:

### I. ENTIRE LINE REPORTING TO THIS OFFICE.

A total of 12,054,632 miles of single track report to this office, an increase over last year of 10.365 per cent.

The total capital stock is \$347,709,785.49, a gain of 3.82 per cent.

The capital stock per mile is \$29,388.64, a decrease of 4.15 per cent.

The total debt is \$404,527,998.69, an increase of 12.88 per cent.

The debt per mile is \$33,557.90, an increase of 2.28 per cent.

The total gross earnings are \$96,213,653.41, an increase of 16.73 per cent.

The amount per mile of gross earnings is \$7,981.50, an increase of 5.76 per cent.

The total net earnings amount to \$34,655,239.36, an increase of 5.86 per cent.

The net earnings per mile are \$2,895.23, a decrease of 2.35 per cent.

The total passenger earnings are \$20,891,079.13, being 21.72 per cent. of total gross earnings, and an increase of 14.63 per cent.

The passenger earnings per mile are \$1,783.64, an increase of 3.86 per cent.

The total freight earnings amount to \$69,507,360.91, being 72.24 per cent. of gross earnings, and an increase of 16.67 per cent.

The freight earnings per mile are \$5,766.02, an increase of 5.72 per cent.

The amount of mail earnings is \$2,182,705.33, being 2.27 per cent. of gross earnings, and an increase of 21.36 per cent.

The mail earnings per mile are \$181.07, a gain of 9.96 per cent.

The express earnings are \$1,735,405.58, 1.80 per cent. of gross earnings, and a gain of 35.12 per cent.

The express earnings per mile amount to \$143.96, an increase of 22.59 per cent.

The "earnings from other sources" amount to \$1,897,300.46, 1.97 per cent. of total earnings, and 22.65 per cent. increase.

The earnings per mile from "other sources" amount to \$157.39, 11.12 per cent. increase.

The total operating expenses are \$61,313,043.71, 63.72 per cent. of gross earnings, and an increase of 22.51 per cent.

The operating expenses per mile amount to \$5,086.27, an increase of 11.09 per cent.

The expenses for maintenance of way and structures are \$14,059,005.10, 22.93 per cent. of total expenses, and a gain of 24.10 per cent.

The per mile expenses for maintenance of way and structures amount to \$1,166.27, 12.44 per cent. increase.

The expenses for maintenance of cars amount to \$6,055,610.58, 9.88 per cent. of total expenses, and an increase of 19.74 per cent.



The per mile expenses for maintenance of cars are \$502.35, a gain of 8.49 per cent.

The expenses for motive power are \$12,574,893.21, 20.51 per cent. of total expenses, and an increase of 30.00 per cent.

The per mile expenses for motive power are \$1,043.16, a gain of 17.79 per cent.

The expenses for conducting transportation are \$23,768,604.45, 38.76 per cent. of the total expenses, and an increase of 19.72 per cent.

The per mile expenses for conducting transportation amount to \$1,971.74, an increase of 8.47 per cent.

The general expenses amount to \$4,849,156.62, 7.91 per cent. of total expenses, and an increase of 17.35 per cent.

The general expenses per mile are \$402.26, a gain of 6.33 per cent.

## II. PROPORTIONS FOR OHIO.

The companies report 5,835.49 miles of road in Ohio, an increase of 3.20 per cent.

The capital stock amounts to \$185,926,026.17, an increase of 4.80 per cent.

The amount per mile of capital stock is \$31,861.08, an increase of 2.78 per cent.

The debt amounts to \$196,302,510.48, an increase of 3.66 per cent.

The debt per mile is \$33,639.42, an increase of 0.45 per cent.

The gross earnings amount to \$45,822,984.64, an increase of 10.87 per cent.

The gross earnings per mile are \$7,852.30, an increase of 7.44 per cent.

The net earnings amount to \$16,756,107.23, an increase of 6.10 per cent.

The net earnings per mile amount to \$2,871.41, an increase of 2.81 per cent.

The operating expenses amount to \$29,301,700.05, an increase of 18.62 per cent.

The operating expenses per mile amount to \$5,021.30, an increase of 14.97 per cent.

## DELINQUENT REPORTS

No reports have been received from the following:

The Cleveland, Painesville and Ashtabula Railroad Company, the McComb, Deshler and Toledo Railroad Company, the Lessee of the College Hill Railroad, 10 months; the Ohio Southern Railway Company, 3 months; and the Western Union Telegraph Company.\*

The neglect of the Western Union Telegraph Company makes our report of Telegraphs for this year very meagre, 103,662.68 miles reporting last year, and but 430.94 miles this year.

## LENGTH OF LINE REPORTING TO THIS OFFICE.

Of the lines lying wholly or partly in the State, which report to this office, the single main track and branches are 12,054.632 miles in length. Besides these, there are, also, 457.465 miles of double track, and 2,309.863 miles of sidings, making a total mileage of 14,821.960 miles. Of this, 5,835.490 miles of single track are in Ohio; 194.02 miles of

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\* Received since this was written.

double track; 1,185.98 miles of sidings—a total of 7,215.49 miles. The increase over 1880, of the entire line of single track, is 1,132.162 miles, or 10.365 per cent. The increase of the total entire line is 1,398.680 miles, or 10.419 per cent. The increase of the single track in Ohio is 180.670 miles, or 3.195 per cent., and of the total mileage in the State, 105.53 miles, or 1.484 per cent.

The following is a statement of the

RAILWAY MILEAGE IN THE STATE EACH YEAR FROM 1841 TO 1881, WITH THE PER CENT. OF INCREASE OR DECREASE FOR EACH YEAR.

Year.	Miles.	Per cent. of increase or decrease.	Per cent of total mileage reporting to this office.
1841 .....	36		
1842 .....	84	+ 133.33	
1843 .....	84		
1844 .....	84		
1845 .....	84		
1846 .....	84		
1847 .....	129	+ 53.57	
1848 .....	274	+ 112.40	
1849 .....	274		
1850 .....	299	+ 9.12	
1851 .....	572	+ 91.30	
1852 .....	890	+ 55.59	
1853 .....	1,385	+ 55.51	
1854 .....	1,500	+ 8.30	
1855 .....	1,641	+ 9.40	
1856 .....	1,869	+ 13.89	
1857 .....	1,880	+ 0.59	
1858 .....	2,788	+ 47.87	
1859 .....	2,897	+ 3.91	
1860 .....	2,974	+ 2.65	
1861 .....	3,024	+ 1.68	
1862 .....	3,024		
1863 .....	3,051	+ 0.85	
1864 .....	3,051		
1865 .....	3,176	+ 4.09	
1866 .....	3,197	+ 0.67	
1867 .....	3,214	+ 0.53	
1868 .....	3,255.92	+ 1.43	
1869 .....	3,324.02	+ 2.09	55.47
1870 .....	3,374	+ 1.50	53.70
1871 .....	3,457.61	+ 2.46	52.89
1872 .....	3,786.61	+ 9.52	51.11
1873 .....	4,162.97	+ 9.93	56.74
1874 .....	4,374.44	+ 5.08	57.76
1875 .....	4,460.93	+ 1.98	55.88
1876 .....	4,458.98	— 0.04	55.72
1877 .....	4,718.80	+ 5.82	56.91
1878 .....	4,975.98	+ 5.45	58.18
1879* .....	4,771.04	— 4.12	55.78
1880 .....	5,654.82	+ 18.52	51.77
1881 .....	5,835.49	+ 3.20	48.40

\*Returns incomplete. There were probably 5,000 miles of single track in the State in 1879.

There is one county in the State—Morgan—in which there is no railroad in operation.

#### PRIVATE RAILROADS.

Besides the roads above referred to there have been reported 11.23 miles of private railroads, belonging to companies engaged in mining or manufacturing. These roads are mostly on the lands belonging to the persons owing them. The construction and equipment of these roads are estimated to have cost \$149,400.00.

#### INCLINED PLANES, ETC.

Four inclined plane railways, situated in the city of Cincinnati, have been reported. Their aggregate length is 11.07 miles of single track and 6.75 miles of double track. The capital stock authorized by law, as reported, is \$1,350,000, of which \$779,600.00 are paid up. The cost, including equipment, is reported to be \$713,948 37. The length above given, includes 9.75 miles of single track and 6.75 miles of double track of street railroad reported along with these inclined planes and operated by the same parties. The law in this State does not require reports to be made by street railroad companies. In New York, however, street railroads have been required to report since 1867.

#### RAILWAY LINES IN PROGRESS.

Many lines are projected throughout the State. Eight companies have reported a proposed length of 1365.93 miles, of which 84.50 miles are graded. Their capital stock authorized amounts to \$37,110,000, and their funded debt actually issued is \$7,984,000. Many roads are in the course of construction, which have not yet made reports.

#### CAPITAL STOCK.

The total authorized capital stock of the Ohio railroad companies amounts to \$422,553,188.92; an increase over the previous year of \$21,077,799.21, or 5.247 per cent. The following is a showing of the authorized capital stock for the last fourteen years:



Year.	Total authorized capital stock.	Per cent. of increase or decrease.	Per cent. paid up.
1868.....	\$175,186,393 25	.....	98.15
1869.....	179,952,306 01	+ 2.72	97.85
1870.....	205,464,846 25	+ 14.12	95.83
1871.....	245,887,185 71	+ 19.67	85.56
1872.....	298,998,739 71	+ 21.60	73.29
1873.....	322,938,689 71	+ 8.01	76.52
1874.....	368,181,939 71	+ 14.01	71 96
1875.....	335,746,689 71	— 8.81	79.97
1876.....	337,196,689 71	+ .43	80.22
1877.....	366,226,639 71	+ 8 61	75.34
1878.....	368,991,039 71	+ .76	74.67
1879 <sup>*</sup> .....	382,201,629 71	+ 3.58	71.97
1880.....	401,475,389 71	+ 5.04	83.42
1881.....	422,553,188 92	+ 5.25	82.29

The amount of capital stock paid up for the year is \$347,709,785.49, or 82 29 per cent. of the amount authorized. The proportion for Ohio is \$185,926,026.17. The following table shows the growth of the paid in capital stock for the past fourteen years:

Year.	Amount.	Increase or decrease per cent.
1868.....	\$171,960,942 38	.....
1869.....	176,087,825 26	+ 2.40
1870.....	196,893,555 70	+ 11.82
1871.....	210,387,148 87	+ 6.85
1872.....	219,161,127 55	+ 4.17
1873.....	247,099,912 75	+ 12.75
1874.....	264,957,620 48	+ 7.23
1875.....	268,507,543 68	+ 1.34
1876.....	270,842,187 93	+ .87
1877.....	275,909,790 45	+ 1.87
1878.....	275,517,493 72	— .14
1879 <sup>*</sup> .....	275,072,278 44	— .16
1880.....	334,909,089 04	+ 21.75
1881.....	347,709,785 49	+ 3.82

\* Returns incomplete.

#### DEBT.

The funded debt of Ohio railroad companies amounts to \$380,063,-084.41, being an increase of \$46,202,183.16, or 13.84 per cent. over that of the previous year. The unfunded debt amounts to \$24,464,914.28, being a decrease from that of the preceding year of \$30,605.11, or  $\frac{11}{100}$  per cent. The total debt amounts to \$404,527,998.69, an increase of \$46,171,578 05,

or 12.88 per cent. over the previous year. The companies report \$718,820.60 of cash on hand, available to the discharge of their unfunded debts. The following table shows the variation in the debts of the entire lines of road for the past fourteen years :

Year.	Funded debt.		Unfunded debt.		Total debt.	
	Total.	Per cent. of increase or decrease.	Total.	Per cent. of increase or decrease.	Amount.	Per cent. of increase or decrease.
1868.....	\$133,111,293 88	.....	\$8,494,465 73	.....	\$141,605,759 61	.....
1869.....	155,119,115 82	+ 16.53	31,766,695 98	+ 273.97	186,885,811 80	+ 31.97
1870.....	155,633,627 09	+ .33	5,590,823 46	— 82.40	161,224,450 55	— 17.33
1871.....	171,011,069 57	+ 9.88	6,541,632 33	+ 17.02	177,552,701 90	+ 10.12
1872*.....	217,171,755 12	+ 26.99	10,738,179 72	+ 64.15	227,909,934 84	+ 28.36
1873.....	238,148,362 04	+ 9.66	15,483,814 38	+ 44.19	253,632,176 42	+ 11.29
1874.....	257,825,315 55	+ 8.26	19,872,681 92	+ 28.34	277,697,997 47	+ 9.49
1875.....	269,470,632 92	+ 4.11	32,101,384 31	+ 61.53	301,572,017 23	+ 8.59
1876.....	274,208,045 50	+ 1.76	29,282,173 93	— 8.78	303,490,219 43	+ .60
1877.....	282,495,121 32	+ 3.02	25,533,517 66	— 12.75	308,028,638 98	+ 1.49
1878.....	284,489,425 82	+ 0.71	23,182,650 62	— 9.27	307,672,076 44	— .12
1879*.....	152,534,473 04	— 46.37	9,427,458 61	— 63.65	161,961,931 65	— 47.36
1880.....	233,860,901 25	+ 118.87	24,495,519 39	+ 159.88	358,356,420 64	+ 121.26
1881.....	380,063,084 41	+ 13.84	24,464,914 28	— .11	404,527,998 69	+ 12.88

\* Returns not complete.

The proportion for Ohio of the funded debt is \$184,442,691.04, an increase of \$8,014,264.70, or 4.54 per cent. The proportion of the unfunded debt for Ohio is \$11,859,819.44, a decrease of \$1,084,811.16, or 8.04 per cent. The proportion of the total debt for Ohio is \$196,302,510.48, an increase of \$6,929,453.54, or 3.66 per cent.

The amount of stock and debt for Ohio is \$382,228,536.65, an increase of 4.021 per cent. over the preceding year. The proportions for Ohio of the funded, unfunded and total debts, and their variation for the fourteen years last past, are given in the table below :

Year.	Funded debt.		Unfunded debt.		Total debt.	
	Proportion for Ohio.	Per cent. of increase or decrease.	Proportion for Ohio.	Per cent. of increase or decrease.	Proportion for Ohio.	Per cent. of increase or decrease.
1868.....	\$75,206,330 37	.....	\$4,790,212 10	.....	\$79,996,548 47	.....
1869.....	88,037,702 28	+ 17.06	18,040,582 40	+ 276.61	106,078,284 68	-  32.64
1870.....	84,137,609 38	— 4.43	3,041,030 72	— 83.14	87,178,640 10	— 17.82
1871.....	92,313,475 00	+ 9.72	3,531,506 30	+ 16.13	95,844,981 30	-  9.94
1872.....	120,222,072 00	+ 30.23	5,945,700 98	+ 68.36	126,167,772 98	-  31.64
1873.....	130,585,217 48	+ 8.62	9,663,228 30	+ 62.52	140,248,445 78	-  11.16
1874.....	136,836,554 76	+ 4.78	15,596,810 57	+ 61.40	152,433,365 33	-  8.69
1875.....	144,514,285 60	+ 5.61	16,732,260 64	+ 7.28	161,247,086 24	-  5.78
1876.....	147,452,402 24	+ 2.03	18,941,847 82	+ 13.21	166,394,250 06	-  3.13
1877.....	152,620,432 72	+ 3.51	18,226,469 06	— 3.78	170,846,901 78	-  2.68
1878.....	158,312,883 88	+ 3.73	12,900,694 86	— 29.22	171,213,578 74	-  .21
1879 <sup>*</sup> .....	77,426,379 99	— 51.03	4,785,370 60	— 62.91	82,211,750 59	— 51.98
1880.....	176,428,426 34	+ 127.87	12,944,630 60	-  173.43	189,373,056 94	-  130.35
1881.....	184,442,691 04	+ 4.54	11,859,819 44	— 8.04	196,302,510 48	-  3.66

\* Returns not complete.

## STOCK AND DEBT.

The total paid in stock and debt for the past year is \$752,237,784.18, an increase over the previous year of \$58,972,274.50, or 8.43 per cent. The net earnings of the entire lines reporting this year amount to 4.607 per cent. on this stock and debt. The paid up stock and debt, and the percentages of the net earnings thereto, for each of the past fourteen years, have been as follows:

Year.	Total paid in stock and debt.	Per cent. of increase or decrease.	Per cent. of net earnings to total stock and debt.
1868.....	\$313,566,701 99	.....	4.528
1869.....	362,973,637 06	+ 15.76	4.237
1870.....	358,118,006 25	— 1.31	4.433
1871.....	387,939,850 77	+ 8.33	4.815
1872.....	446,859,125 02	+ 15.18	4.603
1873.....	500,732,089 17	+ 12.05	4.200
1874.....	542,655,617 95	+ 8.37	3.648
1875.....	570,079,560 91	+ 5.05	3.073
1876.....	574,332,407 36	+ 0.75	3.113
1877.....	583,937,429 43	+ 1.67	2.528
1878.....	583,189,570 16	— 0.13	3.368
1879 <sup>*</sup> .....	437,072,278 44	— 25.06	4.320
1880.....	693,266,509 68	+ 58.70	4.712
1881.....	752,237,784 18	+ 8.43	4.607

\* Returns not complete.

## COST OF ROAD AND EQUIPMENT.

The total cost of road and equipment amounts to \$696,194,896.07, an increase of \$76,304,295.75, or 12.309 per cent. The amount given is not exact, owing to the fact that several of the companies are unable to determine the exact cost—some not having kept accurate accounts—and others having purchased their roads at judicial or other sales, the original cost not being known. For the past fourteen years the cost

reported has been as follows. The same remark concerning their exactness applies to each :

Years.	Entire line.		Proportion for Ohio.	
	Amounts.	Per cent of increase or decrease.	Amounts.	Per cent. of increase or decrease.
1868.....	\$302,569,874 04	.....	\$167,036,614 51	.....
1869. ....	321,666,115 45	+ 6.31	176,455,722 84	+ 5.64
1870.....	333,496,116 86	+ 3.67	176,142,084 01	— .18
1871.....	365,778,316 25	+ 9.68	188,152,405 56	+ 6.82
1872.....	388,113,494 48	+ 6.11	206,352,805 71	+ 9.69
1873.....	462,094,996 87	+ 19.06	258,400,155 25	+ 25.22
1874.....	484,268,484 79	+ 4.79	272,937,812 29	+ 5.63
1875.....	496,224,906 76	+ 2.47	278,314,012 48	+ 1.97
1876.....	505,937,839 46	+ 1.96	283,090,404 39	+ 3.35
1877.....	510,073,423 73	+ .82	288,459,168 47	+ 1.89
1878.....	509,828,582 84	— .05	280,779,414 71	— 2.66
1879.....	509,407,151 55	— .08	260,236,685 33	— 7.32
1880.....	619,890,600 32	+ 21.69	312,459,197 30	+ 20.06
1881.....	696,194,896 07	+ 12.31	343,091,394 64	+ 9.80

The proportion of the cost, for Ohio, is \$343,091,394.64, an increase over the previous year, of \$30,632,197.34, or 9.80 per cent.

#### STEEL RAIL.

6,199.77 miles of steel rails are laid upon the Ohio railroads, or 51.43 per cent. of the single track of the entire line. This is an increase over the previous year of 1,480.43 miles, or 31.37 per cent. The miles laid with steel rails in Ohio number 3,204.42, being 54.91 per cent. of the single track in the State.

The total mileage of the United States, as given by Poor, for 1880, is 93,669.50, of which 33,679.66 miles, or 35.95 per cent., are laid with steel rails.

The increase of steel rail within the State for the last year has been 352.12 miles, or 12.34 per cent.



For the past seven years, the following showing, concerning the miles laid with steel rails, is made :

Year.	Entire line.			In Ohio.		
	Steel rail, miles.	Per cent. to single track.	Per cent of increase.	Steel rail, miles.	Per cent. to single track.	Per cent of increase.
1875.....	1,433	17.43	.....	745	16.70	.....
1876.....	1,920	23.99	27.15	954	21.39	28.32
1877.....	2,553	30.78	32.97	1,236	26.18	29.56
1878.....	2,842	33.23	11.32	1,503	30.20	22.41
1879*.....	3,551	41.52	24.95	1,893	39.70	25.95
1880.....	4,719.34	43.21	32.91	2,852.30	50.52	50.68
1881.....	6,199.77	51.43	31.37	3,204.42	54.91	12.34

## RAILROAD TELEGRAPH LINES.

There are 12,154.15 miles of telegraph upon the lines of road operated by Ohio Railroad Companies. This is an increase of 769.06 miles, or 6.754 per cent. The proportion for Ohio is 6,369.86 miles, an increase of 437.11 miles, or 7.368 per cent. The growth for the past seven years has been as follows :

Year.	Entire line.		In Ohio.	
	Miles.	Per cent. of increase or decrease.	Miles.	Per cent. of increase or decrease.
1875.....	1,102	.....	608	.....
1876.....	1,144	+ 3.81	627	+ 3.12
1877.....	9,061	+ 692.05	4,876	+ 677.67
1878.....	9,450	+ 4.29	5,822	+ 19.40
1879*.....	9,107	— 3.63	5,785	— .63
1880.....	11,385.09	+ 25.01	5,932.75	+ 2.55
1881.....	12,154.15	+ 6.75	6,369.86	+ 7.37

\* Returns not complete.

## GAUGE OF TRACK.

The following roads have the 3-feet gauge:

Number.	Names.	Length of track in Ohio.		
		Single track.	Sidings, &c.	Total miles.
1	Alliance & Lake Erie R. R.....	25.00	1.00	26.00
2	Bellaire & South-western Railway.....	42.00	1.32	43.32
3	Chagrin Falls & Southern Railroad.....	5.00	.....	5.00
4	Cincinnati & Eastern R. R.....	87.00	2.31	89.31
5	Cincinnati, Georgetown & Portsmouth R. R.....	28.60	1.10	29.70
6	Cincinnati Northern R. R.....	24.20	1.00	25.20
7	Cincinnati & Westwood R. R. ....	5.63	.33	5.96
8	College Hill R. R. ....	6.00	.....	6.00
9	Columbus, Washington & Cincinnati R. R.....	20.18	.07	20.25
10	Connotton Valley Railway.....	60.20	6.78	66.98
11	Painesville & Youngstown R'y.....	61.80	5.35	67.15
12	St. Clairsville Northern R'y.....	3.50	.....	3.50
13	St. Clairsville R'y.....	6.65	.35	7.00
14	Toledo, Delphos & Burlington R. R.....	314.40	16.23	330.63
	Totals.....	690.16	35.84	726.00

This is an increase over last year, of the single track, of 129.95 miles, or 23.2 per cent.

The gauge of other tracks varies from 56, 56.50, 56.75, 57, to 58 inches.

## BALLASTING AND WEIGHT OF RAIL PER YARD.

There are 5,156.35 miles of road reported ballasted. Some are wholly ballasted, others only in part, and some not at all. For the particular description of the road and their ballast, reference is made to the engineer's report. The weight of steel rail laid on the road varies from 30, 35, 37½, 40, 50, 52½, 53, 56, 60, 65, to 67 pounds per yard. The greater part is laid with 60-pound steel. The iron rail varies also between 30 and 60 pounds per yard, the greater part being of 56 and 60-pound iron.

## FENCING, BRIDGES, TRESTLES AND TUNNELS IN OHIO.

The total number of miles of single fence reported is 7,184.2. This is not exact. Some of the roads report all fenced without giving the

miles, and others report the number of miles "not known." The miles reported, however, are 1,518.2 more than last year, or an increase of 26.8 per cent.

There are 1,545 railroad bridges in the State. Their aggregate length is 139,095.2 feet. Of these bridges, 942 are wooden, with an aggregate length of 90,594.1 feet. The greatest age of the wooden bridges is 21 years. There are two roads that report bridges of this age, viz.: the P., C. & St. L. and the Cincinnati and Muskingum Valley Railways.

There are 276 iron bridges, 64 more than last year. Their aggregate length is 30,399. feet, 5,465.1 feet more than last year. The C., C., C. & I. R'y Co. reports the oldest iron bridges—40 years. The Central Ohio R. R. Co. reports iron bridges of 29 years of age. The N. Y., P. & O. R. R. Co., some 26 years old. The Iron R. R. Co., 20 years.

There are 153 combination bridges, with an aggregate length of 6,694.4 feet. The oldest are reported by the Cleveland and Pittsburgh R. R., and are 30 years of age.

There are also 168 stone-arch bridges, with an aggregate length of 11,207.6 feet. The oldest—30 years—is reported by the Cleveland and Pittsburgh R. R. There are others 28, 26 and 20 years of age.

Besides these, there are, also, 6 pile bridges on the P. F't. W. and C. R'y, renewed every five years.

There are 2,139 trestles in the State. Their aggregate length is 269,951 feet. The longest, 4,130 feet, is found on the Toledo, Canada Southern and Detroit R'y. The oldest, 14 years, is on the Dayton and Michigan Railroad. The highest, 90 feet, is on the Marietta and Cincinnati Railroad.

There are 38 tunnels in the State—16 are stone, 7 brick, and 15 wood. Their aggregate length is 27,940 feet.

The particulars in regard to the condition of these "characteristics" are given in the engineer's reports under the various roads.

#### ROLLING STOCK.

The following table shows the rolling stock that has been in use each year, for the last seven years :

Year.	Rolling stock.					
	Parlor and sleeping cars.	Locomotives.	Express and baggage-cars.	Passenger-cars.	Freight-cars.	Other cars.
1875 .....	142	2,321	521	1,006	47,314	2,452
1876 .....	132	2,397	501	1,064	48,762	1,263
1877 .....	94	2,407	462	1,070	48,485	1,824
1878 .....	88	2,413	479	1,047	50,152	1,617
1879* .....	61	2,135	428	902	44,487	3,216
1880 .....	105	2,650	619	1,207	58,995	2,167
1881 .....	104	2,916	612	1,343	80,734	2,586

\* Returns incomplete.

In 1880 the average number of cars per locomotive was a little less than 24; this year, a little more than 29.

#### GRADE CROSSINGS.

There are 252 railroad grade crossings reported, or 126 actual crossings, and 41 that are either above or below grade. At these grade crossings there have been 24 collisions.

There are 6,216 highway crossings at grade in the State, only 297 of which are protected by gates or flagmen. At these crossings 27 persons have been killed and 24 injured during the past year. There are 360 crossings above grade, and 196 below. Out of the 360 crossings above, 198 are reported as being on bridges that are 18 feet or more above the track, while 14 are less than 18 feet above the track.

#### STATIONS.

The Ohio railroads own 2,371 freight and passenger stations; 1,458 have telegraph communication, 1,246 of which are operated by the railroad companies. Of the total number of stations 1,464 are in Ohio, 891 having telegraph communication, 766 being operated by the railroad companies themselves.

## EMPLOYEES.

The following is a table showing the employes of railroads in Ohio for the past fourteen years, and of the entire line for the past nine years, together with the average number of employes per mile of road operated for the past fourteen years :

Year.	Entire line.	Proportion for Ohio.	Average number of employes per mile of road operated (nearest whole number).
1868 .....		19,884	6.
1869 .....		21,732	7.
1870 .....		21,895	7.
1871 .....		21,193	6.
1872 .....		25,393	7.
1873 .....	57,406	29,433	7.
1874 .....	50,872	27,711	6.
1875 .....	48,216	27,716	6.
1876 .....	51,379	26,433	6.
1877 .....	49,600	26,502	6.
1878 .....	47,294	25,146	5.
1879* .....	41,260	22,9 9	5.
1880 .....	62,171	29,498	5.
1881 .....	75,312	34,460	6.

\* Returns not complete.

## LOSSES, DAMAGES, ETC., PAID.

The amount paid for losses of and damages to goods and baggage on the Ohio railroads during the past year was \$163,931.85. The following is the statement for 9 years :

Year.	Amount.	Per cent. of increase or decrease.
1873.....	\$294,106 82	
1874.....	287,272 44	— 2.32
1875.....	244,403 89	— 14.99
1876.....	177,699 54	— 27.29
1877.....	128,465 66	— 27.70
1878.....	114,948 61	— 10.52
1879.....	85,016 44	— 26.04
1880.....	152,349 14	+ 79.19
1881.....	163,931 85	+ 7.60
Total.....	\$1,648,194 39	
Average per year .....	\$183,132 71	

For injuries to passengers, employes and others, the following amounts were paid during the past nine years:

Year.	For injuries to—			
	Passengers.	Employes.	Others.	Total.
1873.....	\$32,153 62	\$35,687 92	\$64,785 45	\$132,626 99
1874.....	23,161 69	84,923 90	9,565 39	117,650 98
1875.....	14,698 58	71,010 32	7,133 15	92,842 05
1876.....	9,024 65	45,549 60	25,487 05	80,061 30
1877 (a) .....	337,804 79	85,971 96	6,956 24	430,732 99
1878.....	6,473 95	20,263 35	26,122 12	52,859 42
1879.....	36,064 62	37,714 03	9,074 25	82,852 90
1880.....	20,687 45	30,315 41	7,395 85	58,398 71
1881.....	32,859 78	43,383 21	22,638 92	(b) 99,033 07
Totals.....	\$512,929 13	\$454,819 70	\$179,158 42	\$1,147,058 41
Average per year .....	\$56,992 12	\$50,535 52	19,906 49	\$127,450 93

(a) Ashtabula disaster happened this year—89 were killed and 63 injured.

(b) This total is greater than sum of other three, because some roads reported only total.



The following is a tabulated statement of the animals killed by railroad companies during the past nine years, and the amount of damage paid by them therefor :

Year.	Horses.	Mules.	Cattle.	Sheep.	Hogs.	Damages paid.	Increase or decrease per cent. of damages paid.
1873.....	227	27	1,099	590	241	\$33,364 78	
1874.....	285	41	1,550	603	324	57,547 15	-- 72.48
1875.....	247	21	1,055	472	232	35,668 68	— 38.02
1876.....	250	24	752	424	209	36,356 91	-- 1.93
1877.....	181	33	484	251	277	24,092 32	— 33.73
1878.....	190	14	559	355	198	25,836 49	-- 7.24
1879.....	116	13	393	217	200	14,127 47	— 45.32
1880.....	186	10	663	588	376	21,765 13	+ 54.06
1881.....	187	21	602	795	294	27,009 19	-- 24.10
Total .....	1,869	204	7,157	4,295	2,351	\$275,768 12	
Average .....	207 $\frac{2}{3}$	22 $\frac{2}{3}$	755 $\frac{2}{3}$	477 $\frac{2}{3}$	261 $\frac{2}{3}$	\$30,640 90	

Total number of animals killed in nine years..... 15,876  
Average per year..... 1,764  
Average per day ..... 4.83

Losses on goods and baggage paid in nine years..... \$1,648,194 39  
Losses for injuries paid in nine years ..... 1,147,058 41  
Losses for animals killed paid in nine years..... 275,768 12

Total losses paid in nine years ..... \$3,071,020 92  
Average per year ..... 341,224 55

Out of 192 derailments of trains during the past year, 16 have been caused by animals being on the track.

#### TRAIN AND CAR MILEAGE.

The following tables show the classified train mileage and car mileage, with the percentages of the total, and the per cent. of increase or decrease for the past nine years :

TRAIN MILEAGE.

Year.	Passenger.			Freight.			Mixed.		
	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of total.	Per cent. of increase or decrease.
1873.....	14,729,002	24.72	.....	37,893,373	63.60	.....	1,181,789	1.98	.....
1874.....	14,821,979	24.92	+ .63	39,822,014	66.98	+ 5.09	704,612	1.19	- 40.38
1875.....	15,450,921	26.75	+ 4.24	35,808,698	62.00	- 10.08	1,205,763	2.09	+ 71.12
1876.....	17,430,136	29.88	+ 11.35	37,366,061	64.01	+ 4.35	990,159	1.70	- 17.88
1877.....	15,905,094	29.07	- 8.72	36,217,631	66.24	- 3.08	446,511	.82	- 55.01
1878.....	16,004,307	28.77	+ .62	36,243,754	65.16	.07	768,926	1.38	+ 72.21
1879 <sup>a</sup> .....	13,999,265	26.65	- 12.53	31,398,737	59.79	- 13.37	3,871,296	7.37	+ 403.60
1880.....	18,231,226	26.33	+ 30.23	44,522,326	64.30	+ 41.80	2,180,712	3.15	- 43.66
1881.....	19,242,209	28.10	+ 5.55	41,759,304	60.98	- 6.26	5,550,332	8.11	+ 154.52

<sup>a</sup> Returns incomplete.

## TRAIN MILEAGE—Continued.

Year.	Switching.			Work.			Construction, etc.			Totals.	
	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of increase or decrease.
1873.....	.....	.....	.....	.....	.....	.....	5,778,626	9.70	.....	59,582,790	.....
1874.....	.....	.....	.....	.....	.....	.....	4,104,797	6.91	— 28.97	59,453,402	— .22
1875.....	.....	.....	.....	.....	.....	.....	5,288,128	9.16	— 28.82	57,753,510	— 2.86
1876.....	.....	.....	.....	.....	.....	.....	2,565,381	4.40	— 51.49	58,351,737	— 1.04
1877.....	574,829	1.05	.....	405,987	.76	.....	1,125,862	2.06	— 56.11	54,675,914	— 6.29
1878.....	673,059	1.21	— 17.09	197,276	.35	— 51.41	1,648,633	2.96	— 46.43	a) 55,616,634	— 1.72
1879 <sup>e</sup> .....	590,129	1.12	— 13.55	5,200	.01	— 97.36	2,655,743	5.06	— 61.08	52,520,370	— 5.57
1880.....	2,069,414	2.99	— 250.67	.....	.....	.....	2,241,481	3.23	— 15.60	69,245,159	— 31.84
1881.....	.....	.....	.....	.....	.....	.....	1,923,966	2.81	— 14.16	68,475,811	— 1.11

(a) This total is greater than the sum of the several classes given.

<sup>e</sup> Returns incomplete.

COMPARATIVE STATEMENT OF CAR MILEAGE.

Year.	Passenger.			Express and baggage.			Freight—loaded.		
	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Miles.	Per cent. of total.	Per cent. of increase or decrease.
1873.....	28,984,604	7.65	.....	12,872,545	3.40	.....	270,941,478	86.87	71.49
1874.....	37,624,857	5.59	- 29.81	18,198,566	2.70	- 41.38	470,954,900	80.52	- 73.56
1875.....	37,327,928	6.41	- .79	18,399,094	3.16	- 1.10	396,135,736	79.76	- 15.89
1876.....	48,937,146	6.89	- 31.08	21,150,220	2.98	- 14.95	470,664,138	77.59	- 18.81
1877.....	51,913,636	6.83	- 6.08	18,281,567	2.40	- 13.51	516,489,442	79.27	- 9.74
1878.....	52,122,845	6.46	- .40	18,662,543	2.31	- 2.04	561,426,804	80.71	- 8.70
1879*.....	45,616,176	5.75	- 12.48	19,501,828	2.46	- 4.50	549,908,538	79.36	- 2.05
1880.....	66,721,345	6.18	- 46.27	23,508,286	2.18	- 20.54	795,396,257	84.01	- 44.64
1881.....	61,234,662	6.03	- 8.22	27,759,310	2.73	- 18.08	690,783,974	78.92	- 13.15

\* Returns incomplete.

## COMPARATIVE STATEMENT OF CAR MILEAGE—Continued.

Year.	Freight—empty.				Caboose.			Construction, etc.			Total.	
	Mileage.	Per cent.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of total.	Per cent. of increase or decrease.	Mileage.	Per cent. of increase or decrease.
1873...	40,952,884	13.13	10.81	.....	11,513,233	3.04	.....	13,697,288	3.61	.....	378,962,032	.....
1874...	113,928,058	19.48	16.91	- 178.19	19,991,830	2.97	- 73.64	12,793,301	1.90	- 6.60	673,491,512	- 80.35
1875...	100,503,319	20.24	17.23	- 11.78	20,549,526	3.52	- 2.79	10,132,037	1.74	- 20.80	583,067,640	- 13.43
1876...	136,811,074	22.41	19.25	- 36.13	22,096,653	3.19	- 7.52	11,066,274	1.57	- 9.22	710,725,505	- 21.89
1877...	135,050,876	20.73	17.76	- 1.29	23,338,996	3.07	- 5.62	15,343,170	2.02	- 38.65	760,417,687	- 6.99
1878...	134,238,586	19.29	16.63	- .61	27,643,855	3.43	- 18.44	12,776,861	1.59	- 16.72	806,871,494	- 6.11
1879*	143,035,805	20.64	18.03	- 6.55	24,391,009	3.07	- 11.77	10,985,814	1.38	- 14.02	793,438,670	- 23.97
1880...	151,444,511	15.99	14.04	- 5.88	27,284,063	2.53	- 11.86	14,205,194	1.32	- 29.35	1,078,559,656	- 35.69
1881...	184,709,123	21.08	18.20	- 21.24	34,509,280	3.40	- 26.00	16,225,230	1.60	- 14.22	1,015,221,579	- 5.87

\* Returns incomplete.

## FUEL CONSUMED.

During the year 122,536 cords of wood and 2,327,834 tons of coal, costing \$4,655,993.68, were consumed upon Ohio railroads. This is a decrease in the cost of fuel for this year from that of the previous one of \$97,419 25, or 2.5 per cent.

## PASSENGER TRAFFIC.

The following is a statement of the passenger traffic for the past fourteen years:

Year.	Number.	Increase or decrease per cent.	Number of passengers carried one mile.	Increase or decrease per cent.	Average received per passenger, per mile traveled.
					<i>Cents.</i>
1868.....	9,436,416				
1869.....	10,361,078	+ 9.80	470,284,462		3.317
1870.....	11,883,657	-- 14.70	555,189,996	-+ 18.05	3.026
1871.....	12,000,000	-- .90	413,419,943	— 25.54	3.957
1872.....	12,068,832	-+ .57	549,515,164	-+ 32.81	2.965
1873.....	13,885,688	-+ 15.05	605,614,937	-+ 10.21	2.838
1874.....	15,487,294	-- 11.53	621,887,641	-+ 2.68	2.769
1875.....	17,193,948	-- 11.02	654,804,294	-+ 5.29	2.599
1876.....	18,175,963	-+ 5.61	653,184,018	— .25	2.524
1877.....	17,297,852	— 4.83	697,097,680	-+ 6.72	2.237
1878.....	16,626,151	— 3.88	591,003,887	— 15.22	2.477
1879 <sup>o</sup> .....	15,040,873	— 9.53	542,614,915	— 8.19	2.479
1880.....	20,475,093	-+ 36.13	767,870,514	-- 41.51	2.373
1881.....	22,830,441	-+ 11.50	920,108,052	-+ 19.82	2.336

<sup>o</sup> Returns incomplete.

From this table it will be noticed that there has been an almost continual decrease in the rate received per mile from 3.3 cents in 1869, to 2.3 cents in 1881.



## FREIGHT TRAFFIC.

The total tonnage for the year amounts to 55,279,369 tons, an increase over the previous year of 6,768,183 tons, or 13.952 per cent. Of this total there are reported 29,531,238 tons, or 53.422 per cent. of local freight, and 20,449,230 tons, or 36.992 per cent. of through freight; of the remainder it is probable that about 60 per cent. were local and 40 per cent. through freight.

The following table shows the growth of the freight traffic of Ohio railroads for the past fourteen years:

Year.	Local.		Through.		Total.		Ton—miles.		Rate rec'd per ton per mile.
	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons. *	Per cent. of inc' or dec'.	Amounts.	Increase or decrease.	
									Cents.
1868.....	1,418,878	85.85	233,823	14.15	1,652,701				
1869.....	7,990,105	54.88	6,569,599	45.12	14,559,704	-- 780.96	1,332,307,931	.....	2.446
1870.....	7,847,083	52.79	5,938,902	40.62	14,864,598	-† 2.05	1,673,017,568	-- 25.57	1.993
1871.....	8,874,159	57.38	6,231,364	40.62	15,464,340	-- 4.03	1,773,983,405	-† 6.03	2.215
1872.....	12,062,392	57.48	6,109,207	29.11	20,983,068	-† 35.68	2,923,292,084	-† 64.78	1.569
1873.....	19,384,982	72.94	7,204,580	27.06	26,589,562	-- 26.72	3,420,889,453	-† 17.02	1.566
1874.....	18,374,756	69.10	7,824,679	30.90	26,199,435	— 1.46	3,717,622,979	-† 8.67	1.334
1875.....	15,499,697	60.19	6,544,589	25.41	25,750,501	— 1.71	3,431,745,707	— 7.69	1.259
1876.....	14,648,719	49.91	7,075,631	24.11	29,348,799	-† 13.58	3,799,397,649	-† 10.71	1.117
1877.....	16,755,046	55.23	9,098,618	29.99	30,338,004	-† 3.37	4,146,926,306	-† 9.15	.933
1878.....	16,050,210	50.30	10,921,055	34.22	31,909,172	-† 5.17	4,286,378,592	-† 3.36	.961
1879†.....	17,152,825	51.52	12,989,884	38.79	33,487,248	-† 4.94	4,914,503,869	-† 14.65	.815
1880.....	25,797,015	53.18	18,554,747	38.24	48,511,186	-† 44.86	6,655,562,182	-† 35.43	.895
1881.....	29,531,238	53.42	20,449,230	36.99	55,279,369	-† 13.95	7,607,215,616	-† 14.30	.915

\* Some roads reported only total.

† Returns incomplete.

From this table it will be seen that there has been almost a continual decrease in the rate per ton per mile received, from 2.4 cents in 1869, to 0.9 cents in 1881.

CLASSIFIED STATEMENT OF THE TONNAGE DURING THE PAST SIX YEARS.

Year.	Coal.		Stone, lime, etc.		Petroleum.		Ores.		Pig and bloom iron.		Manufactured iron.		Merchandise.	
	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.
1876.....	7,356,054	25.06	1,025,672	3.49	992,992	3.38	1,200,349	4.09	615,663	2.10	758,798	2.59	2,250,257	7.67
1877.....	7,727,444	25.47	819,026	2.69	1,306,362	4.36	1,218,277	4.01	567,495	1.87	713,704	2.35	2,213,960	7.29
1878.....	7,480,478	23.44	850,030	2.66	1,191,978	3.74	1,484,715	4.65	638,761	2.00	711,739	2.23	1,967,559	6.17
1879 <sup>†</sup> .....	7,173,754	21.48	835,866	2.50	634,803	1.90	1,397,912	4.19	669,094	2.00	768,987	2.30	1,821,693	5.45
1880.....	11,186,006	24.22	1,470,838	3.18	944,113	2.04	2,105,381	4.56	1,107,780	2.40	1,746,979	3.78	2,606,635	5.64
1881.....	14,122,835	26.43	1,963,786	3.67	809,598	1.52	2,379,233	4.45	1,508,621	2.82	1,927,641	3.61	3,912,758	7.32

Year.	Lumber and forest products.		Grain, flour, and other agricultural products.		Live Stock.		Annual products.		Manufactures.		Miscellaneous.		Totals.	
	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of increase or decrease.
1876.....	2,201,248	7.50	6,226,612	21.22	1,700,983	5.80	934,784	3.19	1,351,648	4.60	2,733,039	9.31	29,348,799	.....
1877.....	2,273,636	7.49	6,441,467	21.23	1,804,551	5.94	996,047	3.28	1,462,050	4.81	2,794,985	9.21	30,338,004	3.37
1878.....	2,573,498	8.06	7,410,042	23.22	1,809,395	5.66	1,244,068	3.90	1,669,445	5.22	1,688,484	5.28	31,909,172	5.17
1879 <sup>†</sup> .....	2,422,077	7.25	9,543,702	28.57	1,871,708	5.60	1,345,051	4.03	1,923,831	5.76	1,808,436	5.41	33,401,073	4.67
1880.....	2,611,935	7.82	12,003,075	25.99	2,377,811	5.14	1,387,542	3.00	2,650,561	5.74	2,908,570	6.29	46,192,546	38.30
1881.....	4,698,322	8.79	12,737,394	23.84	2,458,105	4.60	1,539,894	2.88	2,969,109	5.56	2,412,091	4.51	53,439,387	15.68

<sup>†</sup> These totals are greater than the sum of the amounts in the other columns.

<sup>‡</sup> 85,320 tons of coke is included in this total, or 0.20 per cent.

<sup>§</sup> Returns incomplete.

From the preceding table, it will be seen that coal and agricultural products have heretofore made up about one-half of the freight tonnage, each forming about 25 per cent. Lumber and merchandise form about equal amounts, each being a little more than 7 per cent. Live stock and manufactures each have formed about 5 per cent.

#### GROSS EARNINGS.

The gross earnings of Ohio railroad companies for 1881 have been greater than any previous year, and have aggregated \$96,213,853.41, being an increase over 1880 of \$13,785,991.61, or 16.725 per cent. The proportion for Ohio for the past year was \$45,822,984.64, an increase over the previous year of \$4,493,684.16, or 10.873 per cent.

CLASSIFIED TABULATION OF THE GROSS EARNINGS AND THEIR PERCENTAGE FOR 12 YEARS.

Year.	Passenger.			Freight.			Mail.		
	Amounts.	Per cent. of total.	Per cent, in-crease or de-crease.	Amounts.	Per cent. of total.	Per cent, in-crease or de-crease.	Amounts.	Per cent. of total.	Per cent, in-crease or de-crease.
1870.....	\$16,802,719 05	31.76	.....	\$33,348,195 20	63.04	.....	\$770,203 12	1.46	.....
1871.....	16,333,218 82	27.61	- 2.97	39,296,617 11	66.43	- 17.84	813,249 97	1.37	- 5.59
1872.....	16,103,461 81	24.58	- 1.46	45,889,178 26	70.03	- 16.78	847,225 13	1.29	- 4.18
1873.....	17,191,911 70	22.95	- 6.76	53,586,343 12	71.53	- 16.77	1,081,909 81	1.44	- 2.77
1874.....	17,222,304 30	24.28	- .17	49,608,576 52	69.94	- 7.42	1,456,368 99	2.05	- 3.46
1875.....	17,116,524 48	26.54	- .61	43,230,930 14	67.03	- 12.85	1,368,393 14	2.12	- 6.04
1876.....	16,486,867 77	26.06	- 3.68	42,444,092 47	67.11	- 1.82	1,473,353 93	2.32	- 7.67
1877.....	15,592,149 32	26.84	- 5.43	38,678,764 65	66.58	- 8.87	1,572,158 25	2.71	- 6.70
1878.....	14,636,435 76	24.45	- 6.14	41,218,493 18	68.83	- 6.56	1,663,650 50	2.77	- 5.82
1879 <sup>a</sup> .....	13,450,879 46	23.48	- 7.42	40,039,506 66	69.89	- 2.86	1,594,262 81	2.78	- 4.17
1880.....	18,224,420 00	22.11	- 36.23	59,574,349 81	72.27	- 48.79	1,798,549 48	2.18	- 12.81
1881.....	20,891,079 13	21.72	- 14.63	69,507,360 91	72.24	- 16.67	2,182,705 33	2.27	- 21.36

<sup>a</sup> Returns incomplete.

## CLASSIFIED TABULATION OF THE GROSS EARNINGS, ETC.—Continued.

Year.	Express.			Other sources			Total.	
	Amounts.	Per cent. of total.	Per cent., increase or decrease.	Amounts.	Per cent. of total.	Per cent., increase or decrease.	Amounts.	Per cent. of increase or decrease.
1870 .....	\$1,159,268 83	2.20	.....	\$815,426 39	1.54	.....	\$52,895,812 59	.....
1871 .....	1,243,375 74	2.12	+ 7.25	1,464,957 18	2.47	+ 79.66	59,151,418 82	+ 11.82
1872 .....	1,296,899 48	1.98	+ 4.30	1,387,333 77	2.12	— 5.29	65,524,098 45	+ 10.77
1873 .....	1,386,457 55	1.85	+ 6.92	1,670,641 72	2.23	+ 20.42	74,917,263 40	+ 14.37
1874 .....	1,347,171 87	1.89	— 2.83	1,293,772 99	1.82	— 22.56	70,928,194 67	— 5.32
1875 .....	1,474,967 10	2.29	+ 9.48	1,304,511 00	2.02	+ .71	64,495,325 83	— 7.68
1876 .....	1,308,102 47	2.06	— 11.30	1,548,723 99	2.45	+ 18.72	63,261,140 63	— 1.91
1877 .....	1,238,755 41	2.13	— 5.30	1,013,662 24	1.74	— 34.29	58,095,489 87	— 8.21
1878 .....	1,244,512 66	2.07	+ .47	1,136,551 87	1.88	+ 11.12	59,889,643 77	+ 3.09
1879* .....	1,097,541 06	1.92	— 11.81	1,106,173 17	1.93	— 1.86	57,288,363 16	— 4.34
1880 .....	1,283,620 51	1.56	+ 16.95	1,546,918 40	1.88	+ 39.84	82,427,858 20	+ 43.84
1881 .....	1,735,405 58	1.80	+ 35.12	1,897,300 46	1.97	+ 22.65	90,213,853 41	+ 16.73

\* Returns incomplete.

From the preceding table it will be seen that the passenger earnings are, on an average, 25 per cent. of the gross earnings, and the freight about 70 per cent.

## PROPORTION FOR OHIO.

The following is a statement of the proportion for Ohio of gross earnings during the past fourteen years:

Year.	Amounts.	Per cent. of increase or decrease.
1868 .....	\$28,788,827 28	.....
1869 .....	30,136,663 27	+ 4.68
1870 .....	27,909,308 39	— 7.39
1871 .....	30,384,518 27	+ 8.87
1872 .....	34,257,799 67	+ 12.74
1873 .....	38,175,332 39	+ 11.43
1874 .....	37,177,129 74	— 2.61
1875 .....	35,254,117 60	— 5.17
1876 .....	34,119,049 16	— 3.22
1877 .....	31,057,026 66	— 8.97
1878 .....	32,226,634 46	+ 3.76
1879* .....	27,496,974 77	— 14.67
1880 .....	41,329,300 48	+ 50.34
1881 .....	45,822,984 64	+ 10.87

\* Incomplete.



## OPERATING EXPENSES FOR THE PAST ELEVEN YEARS.

Year.	Maintenance of way and structures.			Maintenance of cars.			Motive power.			Conducting transportation.		
	Amounts.	Per cent. of total.	Per cent. of increase or decrease.	Amounts.	Per cent. of total.	Per cent. of increase or decrease.	Amounts.	Per cent. of total.	Per cent. of increase or decrease.	Amounts.	Per cent. of total.	Per cent. of increase or decrease.
1871...	\$11,668,045 76	28.93	.....	\$3,825,921 41	9.48	.....	\$6,230,505 75	15.71	.....	\$15,099,838 70	37.46	.....
1872...	12,758,196 48	28.33	+ 9.34	3,620,648 77	8.04	- 5.34	8,066,604 80	17.91	- 27.41	17,898,990 53	39.74	+ 18.54
1873...	14,783,523 20	27.43	+ 15.88	6,093,306 55	11.31	+ 68.29	8,234,801 66	15.28	+ 2.08	21,172,992 75	39.30	+ 18.29
1874...	14,330,615 82	28.03	- 3.06	4,070,728 25	7.96	- 33.19	9,326,264 56	18.24	+ 13.25	20,491,123 53	40.08	- 3.22
1875...	11,722,455 31	24.94	- 18.89	3,757,889 59	8.00	- 7.68	8,046,602 48	17.13	- 13.72	19,979,877 32	42.53	- 2.49
1876...	11,273,336 91	24.84	- 3.83	5,324,008 44	11.73	+ 41.70	6,376,309 63	14.05	- 20.76	18,814,772 82	41.46	- 5.83
1877...	10,674,885 34	24.64	- 5.31	4,832,391 34	11.20	- 8.86	6,383,131 85	14.73	+ 0.17	17,710,870 09	40.88	- 5.60
1878...	9,841,207 09	24.40	- 7.81	4,555,518 00	11.29	- 6.12	5,702,671 36	14.14	- 10.66	16,650,180 69	41.28	- 6.00
1879...	8,598,698 70	22.48	- 12.62	4,439,771 07	11.61	- 2.54	5,779,814 52	15.11	+ 1.35	16,254,604 23	42.49	- 2.97
1880...	11,329,088 53	22.63	+ 31.75	5,057,232 31	10.10	+ 13.91	9,672,819 77	19.35	+ 67.36	19,853,439 14	39.67	+ 22.14
1881...	14,059,005 10	22.93	+ 24.10	6,055,610 58	9.88	- 19.74	12,574,893 21	20.51	+ 30.00	23,768,604 45	38.76	+ 19.72

\* Returns incomplete, and total is greater than the sum of the other columns.

OPERATING EXPENSES, ETC.—Continued.

Year.	General expenses.			Total.			Proportion for Ohio.	
	Amounts.	Per cent. of total.	Per cent. of increase or decrease.	Amounts.	Per cent. to gross earnings.	Per cent. of increase or decrease.	Amounts.	Per cent. of increase or decrease.
1871 .....	\$3,372,305 76	8.42	.....	\$40,296,667 38	68.13	.....	\$20,776,222 57	.....
1872 .....	2,690,267 63	5.98	— 20.23	45,034,708 21	68.73	+ 11.76	23,502,739 38	+ 13.12
1873 .....	3,600,984 06	6.68	+ 33.85	53,885,608 22	71.92	+ 19.65	27,301,884 17	+ 16.16
1874 . . . . .	2,911,293 14	5.69	— 19.15	51,130,025 30	72.09	— 5.11	27,063,273 85	— 0.88
1875 .....	3,472,814 19	7.40	+ 19.32	46,979,638 89	72.84	— 8.12	25,573,058 14	— 5.51
1876 .....	3,593,274 52	7.92	+ 3.47	45,381,702 32	71.75	— 3.40	24,404,565 31	— 4.57
1877 .....	3,705,868 64	8.55	+ 3.13	43,327,147 26	74.23	— 4.53	22,944,316 20	— 5.98
1878 .....	3,584,371 04	8.89	— 3.28	40,333,948 18	67.51	— 6.98	21,718,648 15	— 5.34
1879* .....	3,166,416 88	8.27	— 11.66	38,251,123 77	66.79	— 5.16	18,246,873 23	— 15.98
1880 .....	4,132,129 66	8.25	+ 30.49	50,044,889 41	60.71	+ 30.57	24,700,767 60	+ 35.37
1881 .....	4,849,156 62	7.91	+ 17.35	61,313,043 71	63.72	+ 22.51	29,301,700 05	+ 18.62

\* Returns incomplete, and total is greater than the sum of the other columns.

From the preceding showing it will be seen that the maintenance of way and structures has not varied materially from 25 per cent. of the total operating expenses, but with a slight tendency gradually to decrease. The motive power has averaged a little more than 15 per cent. of total, and conducting transportation about 40 per cent. There seems to have been no regularity in the expenditures for "maintenance of cars," "motive power," or "general expenses." It will be noticed also that the operating expenses have been on an average 70 per cent. of the gross earnings, but for the last four years they have been below that average.

#### NET EARNINGS, INCOME, ETC.

The net earnings of the railroads of the State have been \$34,677,-568.21, an increase of \$1,917,917.46, or 5.85 per cent. The total deficits amount to \$22,328.85, or \$3,443.00 less than last year. The rentals paid amount to \$11,311,846.14, being an increase of \$2,027,780.53, or about 22 per cent. over the previous year. The net income over operating expenses and rents paid, amounts to \$23,831,120.69, an increase of \$250,281.92—about one per cent. Eleven roads report a loss in operating of \$609,321.86. The net earnings, minus the deficits, have been 4.607 per cent. of the total paid in stock and debt during the year. And by a reference to the table given below it will be remarked that the net earnings have averaged four per cent. of the capital stock and debt, during the past fourteen years, the lowest being 2.5 for 1877, and the highest 4.8 for 1871. It will also be noted that the net earnings have averaged about 31 per cent. of—the gross earnings.



Number.	Name of Company.	Dividends paid on stock.			
		General.		Preferred.	
		Amounts.	Per cent.	Amounts.	Per cent.
1	Central Ohio.....	\$159,074 50	6.50	\$24,693 00	6.00
2	Cincinnati, Hamilton & Dayton.....	70,000 00	2.00	.....	.....
3	Cin., Indianapolis, St. Louis & Chi...	180,000 00	6.00	.....	.....
4	Cin., Sandusky & Cleveland .....	.....	.....	25,731 00	6.00
5	Clev., Col., Cin. & Indianapolis .....	749,540 00	5.00	.....	.....
6	Cleveland & Mahoning Valley.....	262,067 00	9.50	.....	.....
7	Cleveland & Pittsburgh .....	786,891 48	7 and 10	.....	.....
8	Columbus & Hocking Valley .....	185,062 00	Not given	.....	.....
9	Columbus & Xenia .....	150,048 80	8.40	.....	.....
10	Dayton & Michigan.....	36,002 74	3.50	96,900 00	8.00
11	Iron .....	11,989 50	Not given	.....	.....
12	Lake Shore & Michigan Southern...	3,957,320 00	8.00	53,350 00	10.00
13	Lawrence .....	36,000 00	8.00	.....	.....
14	Little Miami.....	370,976 00	8.00	.....	.....
15	Massillon & Cleveland.....	9,782 50	5.00	.....	.....
16	Pittsburgh, Ft. Wayne & Chicago...	1,380,000 00	7.00	490,203 00	7.00
17	Sandusky, Mansfield and Newark...	32,553 00	Not given	.....	.....
	Total .....	\$8,377,307 52	.....	\$690,877 00	.....

Besides these dividends, there have been paid by the Ohio railroad companies \$92,763.55 interest upon the floating debt, and \$754,825.98 of the principal thereof; \$2,399,596.08 have been paid into the sinking fund or applied in canceling bonds. The following table shows the interest and dividends paid during the past fourteen years :

Year.	Interest on bonds, including taxes.	Dividends.
1868.....		\$3,801,290 67
1869.....	\$4,679,156 64	5,647,645 93
1870.....	6,291,317 53	7,002,873 61
1871.....	7,505,432 31	7,278,051 84
1872.....	9,726,359 06	7,554,032 09
1873.....	12,399,659 34	8,965,333 26
1874.....	12,630,377 83	6,512,218 21
1875.....	12,691,903 72	6,377,791 09
1876.....	9,819,202 01	6,236,572 63
1877.....	9,832,989 83	4,520,417 80
1878.....	9,535,566 92	5,277,467 29
1879 <sup>*</sup> .....	7,524,946 33	6,402,948 33
1880.....	13,586,858 29	8,417,793 42
1881.....	13,766,959 53	9,068,184 52

<sup>\*</sup> Incomplete.

#### TAXES.

The valuation of the railroad property of the State, as fixed by the State Board of Equalization for 1881, is \$83,764,315.74, an increase of \$5,916,134.91, or 7.587 per cent. Taxes to the amount of \$1,203,634.28 are reported paid; some companies, however, failed to make returns of taxes paid. The amount actually paid, as reported by County Auditors, is \$1,223,711.28; this is an increase of \$49,208.28, or 4.275 per cent.

The average value per mile in Ohio is \$14,182.93, whereas the average cost per mile in Ohio is \$58,793.93.

The following table shows the valuation of railroad property for the past fourteen years, as fixed by the State Boards of Equalization, and the taxes paid so far as obtainable:



Year.	Value of railroad property, as fixed by State Boards of Equalization.	Taxes paid.
1868 .....	\$50,440,742 89	\$817,611 22
1869 .....	49,777,188 00	842,941 98
1870 .....	52,209,275 67	1,048,802 16
1871 .....	64,876,682 00	902,029 82
1872 .....	68,312,046 00	931,094 56
1873 .....	79,213,550 00	1,095,634 55
1874 .....	85,280,855 00	(a) 1,111,682 01
1875 .....	84,789,794 63	1,327,680 41
1876 .....	84,129,432 65	1,376,126 07
1877 .....	83,264,800 12	Not given.
1878 .....	79,338,186 45	1,128,116 81
1879 .....	75,513,859 13	1,095,729 18
1880 .....	77,848,180 33	1,174,503 00
1881 .....	83,764,315 74	1,223,711 28

(a) Probably more was paid this year, as this is the report of the companies.

From the above table it will be seen that the taxes paid have borne an approximately constant proportion to the valuation, except in the year 1870. But, the valuation has not increased in the same proportion as the mileage; the valuation in 1874 on 4,374 miles being more than the valuation of 5,835 miles in 1881.

## ACCIDENTS.

The following tables show the casualties to persons in Ohio for the past 14 years, as reported by the railroad companies. Some of the companies have been very slow to make any but the most meagre reports concerning accidents:

## PERSONS INJURED.

Year.	Passengers.	Employees.	Others.	Total.
1868.....	41	89	34	164
1869.....	8	113	38	159
1870.....	14	150	40	204
1871.....	18	205	57	280
1872.....	20	283	53	356
1873.....	67	274	57	398
1874.....	12	165	70	247
1875.....	27	181	98	306
1876.....	19	220	102	341
1877.....	107	225	102	434
1878.....	26	237	104	367
1879.....	39	180	90	309
1880.....	32	241	94	367
1881.....	81	440	133	654
Total .....	511	3,003	1,072	4,586
Average.....	36	215	76	327

## PERSONS KILLED.

Year.	Passengers.	Employees.	Others.	Total.
1868.....	9	36	61	106
1869.....	4	69	57	130
1870.....	4	40	76	120
1871.....	4	73	84	161
1872.....	12	92	90	194
1873.....	16	95	99	210
1874.....	6	93	120	219
1875.....	8	93	115	216
1876.....	10	61	116	187
1877.....	94	66	109	269
1878.....	6	63	135	204
1879.....	16	180	97	293
1880.....	12	86	121	229
1881.....	8	111	171	290
Total .....	209	1,158	1,461	2,828
Average .....	15	83	104	202

The casualties resulting in death to persons in Ohio during 1881 have taken place under the following conditions:

Passengers—From causes beyond their control.....	1	
From misconduct or want of caution .....	6	
	—	7
Employees—From causes beyond their control.....	39	
From misconduct or want of caution.....	72	
	—	111
Others—At stations and highway crossings.....	112	
Stealing rides .....	27	
Trespassing on track, etc.....	33	
	—	172
Total killed.....		290

The casualties resulting in injuries during 1881 have happened under the following circumstances :

Passengers—From causes beyond their control.....	49
From misconduct or want of caution.....	32
Total passengers injured .....	81
Employes—From causes beyond their control.....	102
From misconduct or want of caution.....	338
Total employes injured .....	440
Others—At stations and crossings .....	74
Stealing rides .....	24
Trespassing on track .....	35
Total others injured .....	133
Total casualties resulting in injury .....	654
Total casualties.....	944

From the above it will be seen that, on an average, one person is injured every 27 hours, and one person killed every 43 hours. Of the injured, employes make up 65 per cent., passengers 11 per cent., and others 24 per cent.

Of the killed, passengers have made up about 8 per cent.; employes about 41 per cent., and others 51 per cent. The passenger transportation in Ohio has been equivalent to carrying one person 441,652,152 miles. In this transportation one person has been killed from causes beyond his control. Hence, the chances are that a person may travel 441,652,152 miles before he is killed from causes beyond his control. This, at 30 miles per hour, would require 1,680 years.

Of the passengers injured during the year 1881, 49 were from causes beyond their control, 60 per cent., and 32 or 40 per cent. were from misconduct or want of caution; of the passengers killed, 1 or 14 per cent. were from causes beyond their control, and 6 or 86 per cent. from misconduct or want of caution.

Of the employes injured, 102 or 23 per cent. were from causes beyond their control, and 338, 77 per cent., from misconduct or want of caution; of the employes killed, 39 or 35 per cent. were from causes beyond their control, and 72, 65 per cent., were from misconduct or want of caution.

Of the others injured, 74, 56 per cent., were trespassing on track; 24, 18 per cent., were at crossings, and 35, 26 per cent., were stealing rides.

Of the killed, 112, 65 per cent., were trespassing; 27, 16 per cent., crossing track, and 34, 19 per cent., stealing rides.

Of the total 654 injured in 1881, 81 or 12.4 per cent. were passengers; 440 or 67.3 per cent. were employes, and 133 or 20.3 per cent. were others.

Of the total 290 killed in 1881, 7 or 2.4 per cent. were passengers; 111 or 38.2 per cent. were employes, and 172 or 59.4 per cent. were other than passengers or employes.

Of the total 944 casualties, 88 or 9.3 per cent. were to passengers; 551 or 58.4 per cent. were to employes, and 305 or 32.3 per cent. were to others.

The accidents causing injuries only, may be classified for the year 1881, as follows:

ACCIDENTS CAUSING INJURY ONLY, IN 1881

Character of accident.	Passengers.				Employees.				Others.				Totals.	
	Number.	Per cent. of total.	Per cent. of passengers injured.	Per cent. of total injured.	Number.	Per cent. of total.	Per cent. of employees injured.	Per cent. of total injured.	Number.	Per cent. of total.	Per cent. of others injured.	Per cent. of total injured.	Number.	Per cent. of total injured.
Getting on or off engine or train in motion.....	23	31	28.4	3.5	20	27	4.5	3.1	31	42	23.3	4.7	74	11.3
Driving or riding across track.....									23	100	17.3	3.5	23	3.5
Struck by bridge, chute or other obstruction.....	2	7	2.4	0.3	26	93	5.9	4.0					28	4.3
Coupling, or caught between cars and engine.....					208	97	47.3	31.8	7	3	5.2	1.1	215	32.8
Falling or thrown from engine or train	3	4	3.8	0.5	61	87	13.9	9.3	6	9	4.5	0.9	70	10.7
Falling between cars.....	1	25	1.2	0.1	1	25	0.2	0.1	2	50	1.5	0.3	4	0.6
Lying, walking, falling or being on track					11	20	2.5	1.7	44	80	33.1	6.7	55	8.5
Collisions.....	22	42	27.2	3.4	27	52	6.1	4.1	3	6	2.3	0.5	52	8.1
Run over in yards, on sid'g, or switching					8	53	1.8	1.2	7	47	5.3	1.1	15	2.3
Run over catching foot in frog or between rails.....					9	90	2.1	1.4	1	10	0.7	0.1	10	1.5
Engine or train leaving, or thrown from track.....	14	48	17.3	2.1	15	52	3.4	2.3					29	4.4
Broken axles, and exploded or cap-sized engine.....	10	53	12.3	1.5	9	47	2.1	1.4					19	2.9
On hand car struck by engine.....					2	100	.5	0.3					2	0.3
Run over while inspecting wheels.....	1	50	1.2	0.1	1	50	.2	0.1					2	0.3
Breaking of brake rod, chain or wheel in set'g					8	100	1.8	1.2					8	1.2
Miscellaneous.....	5	10	6.2	0.8	34	71	7.7	5.2	9	19	6.8	1.4	48	7.3
Totals.....	81				440				133				654	
Per cent. of total injured.....	12.4				67.3				20.3					

From the preceding it will be seen that 28 per cent. of the passengers injured are injured in getting on or off trains while in motion, 27 per cent. in collisions, 17 per cent in derailments, and 12 per cent. by broken axle or explosion. Also, that 47 per cent. of the employes injured are injured in coupling, 14 per cent. by falling or thrown from engine or train, 6 per cent. in collisions, and 6 per cent. struck by bridge, chute or other obstruction. And, also, 33 per cent. of the other persons injured are injured from lying, walking, falling, or being on the track, 23 per cent. getting on or off train in motion, and 17 per cent. riding or driving across the track; and also, that 33 per cent. of the total injured are injured in coupling, 11 per cent. getting on or off moving train, 11 per cent. falling or thrown from train, 9 per cent. being on track, and 8 per cent. in collisions.

The casualties resulting in death during the year 1881 have been due to the following causes:



CAUSALITIES RESULTING IN DEATH IN 1881.

Character of accident.	Passengers.				Employees.				Others.				Total.	
	Number.	Per cent. of total.	Per cent. of passengers killed.	Per cent. of total killed.	Number.	Per cent. of total.	Per cent. of employees killed.	Per cent. of total killed.	Number.	Per cent. of total.	Per cent. of others killed.	Per cent. of total killed.	Number.	Per cent. of total killed.
Getting on or off engine or train in motion	3	10	43	1.0	3	10	3	1.0	25	81	14.5	8.7	31	10.7
Run over in yards, on sidings, or in switching														
Falling or thrown from engine or train					10	50	9	3.5	10	50	5.8	3.5	20	6.9
Struck by bridge, chute or other obstruction					22	72	20	7.0	8	28	4.7	2.8	30	10.0
Collisions, and standing on platform of car during same	1	14	14	0.4	3	43	3	1.0	3	43	1.1	1.0	7	2.4
Engine or train leaving or thrown from track	1	8	14	0.4	11	92	10	3.8					12	4.2
Coupling, or crushed between cars and engine	2	29	29	0.8	5	71	5	1.7					7	2.4
Riding or driving across track					15	100	14	5.2					15	5.2
Lying, walking, falling or being on track									25	100	14.5	8.7	25	8.7
Explosion or capsizing of engines					22	19	20	7.6	95	81	55.2	32.9	117	40.5
On hand cars, falling from or struck by engine														
Catching foot in frog or between rails, run over					5	100	5	1.7		40			5	1.7
Suicide					7	88	6	2.4	1	12	.5	0.4	8	2.8
Miscellaneous					2	50	2	.7	2	50	1.1	0.8	4	1.4
					6	67	5	2.1	3	33	1.7	1.0	9	3.1
Total	7				111				172				290	
Per cent. of total	2.4				38.2				59.4					

From the preceding table it will be seen that 43 per cent. of the passengers killed are killed in getting on or off the train in motion, 29 per cent. in derailments, 14 per cent. struck by chute or obstruction, and 14 per cent. in collisions. Also, 20 per cent. of the employes are killed by falling, or being thrown from engine or train, 20 per cent. by being on track, 14 per cent. coupling, 10 per cent. collisions, and 9 per cent. run over in yards and switching, or on sidings. 55 per cent. of the others are killed by being on track, lying, walking or falling; 15 per cent. getting on or off moving train; 15 per cent. riding or driving across track, and 6 per cent. run over in yards, on switching or on siding. Also, that 41 per cent. of the total killed are killed by lying, walking or being on switch, 11 per cent. getting on or off moving train, 10 per cent. falling or thrown from train, 9 per cent. riding or driving across tracks, 7 per cent. in yards, on switching or siding, 5 per cent. coupling, and 4 per cent. in collisions.

#### ACCIDENTS IN COUPLING CARS.

By tables hereafter given it will be found that 15 deaths and 208 injuries have happened to employes of railroads reporting in Ohio when in the act of coupling cars, during the year—being one in every 154 of all the employes upon the roads; and one in every 25 of the brakemen employed.

In the list of injuries to employes, 47 per cent. are found to take place in this particular act. Of the employes injured on the New York Central and Erie during the past ten years, 46 per cent. are reported as having been injured in coupling cars. In Massachusetts the per cent. was 30; in Connecticut, 31 during the year 1881, and in Michigan 42 during the year 1880.

So large is the proportion of injuries from this class of accidents in other States, as well as in our own, that legislatures have been invoked to afford some remedy.

In both Massachusetts and Connecticut, where the per cent. of accidents is much smaller than in Ohio, the legislatures have called upon their Railroad Commissioners to make investigations concerning the various methods of coupling freight cars, and make report whether or not there are practical methods, or coupling devices, by which these casualties may be avoided, and the needed legislation, if any is desired, to enforce the use of proper means for a just and proper security to brakemen upon railways.

The Commissioners of both States have made substantially the same report. They say that there are good automatic couplers, well calculated to obviate the necessity of going between freight cars to couple them; and each has recommended to the legislature the enactment of laws requiring that all freight cars thereafter bought or built by the corporations within the State, shall be equipped with automatic couplers.

It is a very reasonable inquiry in view of the many injuries to this class of employes: why it is that the managers of railroads are backward in adopting the means that are calculated to protect their men against the loss of limbs and life, now of so frequent occurrence?

It has been answered that there are many obstacles: There are no means of enforcing the use of such devices, upon cars belonging to corporations outside of the State. By the interchange in the use of cars, at least half of the cars at any one time within the State, belong to outside companies.

There will, therefore, be a moiety that can not be brought within the control of the managers of the railroads of the State, or within the requirements of a statute thereof. Again, there is a difference in the height of cars already made and now in use within the State; a difference so wide as to make it practically impossible properly to adjust automatic devices so as to accomplish the desired end. There is, and must continue to be, a constant intermingling of the cars of the State with those from without the State, and those of various heights from everywhere. It is also said that legislation that would hinder the ordinary exchange of freight cars would greatly retard the rapid transit of freights. All this may be true. There have always been arguments as good as these against changes in the general methods of large enterprises. Yet radical changes are constantly being made in the methods of men; and when it is found that any one method is accompanied with an undue share of burdens or a larger per cent. of casualties than other pursuits are found to bear, and it appears that the managing parties are unable to agree as to the methods, it then becomes the duty of the legislature to attempt to do what individuals or corporations seem unable to accomplish.

Again, it is well known that employes have no right of action against railroad companies when they have suffered injuries in consequence of the carelessness or neglect of a fellow-employe; and courts have not yet held these companies responsible for neglect in providing the means for the greater safety of those in their train service; there is, therefore, little protection afforded by law to the limbs and lives of the 2,622 brakemen now employed in the railway service in Ohio.

The sheltering care, neither of the railway management nor of the law, seems to have been directed to this class of men constantly in danger and more severely suffering than any other of the industrial classes of the State.

Something should be done to lessen the casualties that are incident to this branch of the railway service.

## SPECIAL REPORT.

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OFFICE COMMISSIONER OF RAILROADS AND TELEGRAPHS,  
COLUMBUS, OHIO, *February 6, 1882.*

HON. O. J. HODGE, *Speaker of the House of Representatives:*

SIR: I am in receipt of copy of House Resolution No. 48, adopted January 25, 1882, requesting the Commissioner of Railroads and Telegraphs to inform the House—

(1) "The railroads owned or operated in this State, which have, and now comply with the several provisions of the statute of the State, relative to heating and lighting railway cars, and that he state the means used by such railroad companies in complying with the provisions of law relating to heating and lighting such cars."

(2) "That if any of the railroads in this State have neglected to comply with the provisions of the statute relative to heating and lighting railway cars, the said Commissioner report which, if any, of said delinquent companies have been prosecuted for the penalty provided by law, and if not prosecuted, he inform the House why proceedings have not been instituted to recover such penalties and forfeitures by him, as provided by law."

(3) "That said Commissioner report to the House, what, if any, further legislation, in his opinion, is necessary to prevent the destruction of life and property in railroad accidents of the character of the disaster mentioned above." (Spuyten Duyvil).

In reply, the following is respectfully submitted:

(1) COMPLIANCE OF COMPANIES WITH THE STATUTE IN REGARD TO HEATING AND LIGHTING.

In answer to the first interrogatory of the resolution, the Commissioner begs leave to state, that from information gathered from the sworn statements made by the principal officers of the railroad companies operating roads in Ohio, and from personal observation, he is of the opinion that most, if not all, of the railroad companies in Ohio are using what are termed "improved methods" in heating their passenger cars; and that generally the more ordinary heating stoves are in use upon

baggage, express and mail cars. Some postal-cars, of late construction, are using patent heaters.

Herewith is forwarded a statement, marked "A," and made a part of this report, showing the stoves or heaters, or methods of heating used by the companies reporting.

It will be seen that there is quite a variety of stoves in use which have been made with a view, undoubtedly, of meeting the requirements of the statute. Some of the railroads use one kind only, others use several kinds of stoves or methods of heating.

The superiority of one over another, in the event of a collision or overturning, can not be predetermined by an examination, nor can there be ascertained a sufficient account of their service in collisions and overturnings to determine the most effectual, as contemplated by the statute.

Which of these stoves or heaters "will most effectually guard the passengers against the dangers by fire in case of accident by collision or the cars being overturned, or thrown from the track," the Commissioner considers himself unable to determine, and without the authority to determine.

## (2) PROSECUTIONS OF RAILROAD COMPANIES FOR NON-COMPLIANCE.

From what has been given above, it will be seen, and it is therefore respectfully answered, that all of the railroad companies operating railroads in Ohio, stand in about equal rank in regard to their compliance with the statute made to regulate the use of stoves or heaters.

The Attorney-General, in answer to the inquiry of the Commissioner: Whether, in a prosecution of a railroad company for violations of section 3351, the opinion of the Commissioner of Railroads and Telegraphs, that the stove or heater is insufficient to guard passengers against the dangers of fire, will control, or whether this is a question which a jury must decide, and upon which evidence may be offered?, answered:

"This section, as amended April 14, 1880, reads as follows:

"SECTION 3351. Each railroad company in this State shall, when necessary to heat any of its cars for carrying passengers, mail, baggage, or express matter, do so by a stove or heater so constructed and protected as to most effectually guard the passengers against the dangers by fire in case of accident by collision, or the cars being overturned or thrown from the track, and it shall be unlawful for any such company to permit any other person or corporation to use cars carrying passengers, mail, baggage, or express matter over its road unless the heating apparatus thereof shall conform to the requirements of this section.

"In the trial of a complaint, under the above section, the question as to whether the stove complained of is one that will most effectually guard the passenger against

the danger of fire, is one that the jury must determine, and upon which evidence may be offered *pro* and *con*.

"The section is very indefinite in its terms. The question, as to which stove will most effectually protect passengers from fire, is one upon which there will probably be as many opinions as there are different kinds of stoves."

The section providing for the collection of penalties reads as follows :

"SECTION 3354. Any railroad company refusing or neglecting to comply with the provisions of section *thirty-three hundred and fifty-one*, shall be liable to a penalty of not less than one hundred nor over five hundred dollars, to be recovered in a civil action in any court of record in any county through which such road shall pass, in the name of the State of Ohio, for the benefit of the common schools of the State; to be prosecuted by the Prosecuting Attorney, or at the instance of the Railroad Commissioner, as provided by law (Sec. 263, Revised Statutes,) in other cases for the recovery of penalties and forfeitures against railroad companies, after due notice given by such Railroad Commissioner to the President or managing officer of such delinquent railroad company, and its neglect thereafter for a period of thirty days to comply with the provisions of said section; the Prosecuting Attorney to receive twenty-five (25) per cent. of all fines and costs collected under the provisions of this act."

It will be observed that the Commissioner shall give thirty days' notice to the President or managing officer of such delinquent railroad company, before the company becomes liable to a penalty, and he is powerless to determine what will be a violation of the statute upon which to found a complaint, or wherein there may have been a specific observance of it, since this question is for the future determination of a jury, and possibly varying with every suit.

There have been, therefore, no prosecutions, and no collection of penalties by the Commissioner of Railroads and Telegraphs under section 3351, prescribing heating apparatus for passenger, mail, baggage or express cars; the terms of the statute made it impossible for him to enter upon such prosecutions for penalties.

The compliance of railroad companies with the statute regulating the lighting of passenger cars is general. There is submitted herewith for your examination exhibit marked "B," showing the method of lighting the passenger cars of the several railroads operated in Ohio. This statement is compiled from the sworn reports made to this office for the year ending June 30, 1881, and verified by the oaths of some one of the principal officers.

The statute regulating the lighting of cars is more specific in its terms, and it is the opinion of the Commissioner that there is a general conformity by railroad companies with its requirements.



# ANNUAL REPORT.

Preliminary to answering the third, and last interrogatory, there is most respectfully offered the following suggestions on the accident under consideration, and a more general view of railroad accidents necessary to a better understanding of the matter needing legislation.

The resolution of the House of Representatives recites the words of the Governor of New York, "attributing the heart-rending destruction of life in said accident to the want of proper means for heating and lighting."

It seems that the primary cause of the accident was in the method of running trains on the New York Central and Hudson River Railroad. There was, in consequence of the admission of two trains between immediate stations, a running of one train into another; a crushing of passenger cars into a mass of ruins; and incidentally thereafter a burning of the wreck with passengers imprisoned, which added fatality and horror to the accident.

It is therefore a question, whether the management which thus allows a quick succession of passenger trains within the same section, or the management of the heating apparatus within the cars of the train, which incidentally, now and then, contributes its horrors, most deserves legislative attention.

In order that the facts of the past may contribute as much as possible toward aiding the judgment, there have been prepared several statistical exhibits to accompany this report, which are hereby made a part of it, and which are hereafter designated by letter.

Exhibit "D" shows what accidents have happened to trains on the entire line (excepting L. S. & M. S. & W. St. L. & P., which are for Ohio only), of the railroads reporting to this office. From this it will be learned that fifteen (15) fatalities and sixty-two (62) injuries have resulted from collision, seven (7) fatalities and forty-three (43) injuries have resulted from all other train accidents. In all these there were only two (2) injured by fire. No life was lost by fire or scalding during the year.

The casualties to person in train accidents during the year past upon the roads reporting to Ohio may be considered in terms of per cent., as follows:

Killed by collision.....	68 per cent.
"    fire .....	0   "
"    otherwise .....	32   "
Injured by collision .....	58   "
"    fire .....	2   "
"    otherwise .....	40   "

This showing for Ohio is limited in extent; there is therefore given in exhibit "E" a table showing the railroad train accidents that have happened in the United States (with the exception noted) during the past year ending December 31, 1881. There were 1458 train accidents, in which 459 persons were killed and 1552 injured. Killed by fire, 7, or 1.50 per cent. Injured by fire, none. Of the train accidents:

Collisions made up.....	36.76 per cent.
Derailements made up .....	58.78 "
Others made up .....	4.46 "

In these accidents to trains there were :

Killed in collision.....	209=45.53 per cent.
" derailements .....	237=51.64 "
" otherwise .....	13= 2.83 "

The 7 above spoken of as killed by fire were all killed in derailements.

In these train accidents there were :

Injured in collisions.....	520=33.50 per cent.
" by fire.....	0 0 "
" in derailements.....	995=64.11 "
" by fire ... ..	0 0 "
" otherwise.....	37= 2.39 "

It will be remarked that the per cent. of injury by fire throughout the United States during the year, amounts to  $1\frac{1}{2}$  per cent. in the list of fatalities, and to 0 in the list of injuries.

The inference to be made from the tabulated showings is, that casualties from fires deserve comparatively little consideration.

The real question involved in the Spuyten Duyvil accident is as to the means of avoiding collisions.

By again referring to the table of Ohio accidents ("D") it will be seen that 60.63 per cent. of the casualties in train accidents, on roads reporting to Ohio, took place in collisions, and 39.37 per cent. in other accidents, while in the United States at large, 36.25 per cent. were due to collisions and 63.75 to other causes.

The question may be asked why the above is the case. Why has Ohio more casualties in collisions, comparatively, than the rest of the United States? Without statistical data to determine conclusively, a satisfactory reason may, however, be given. Attention is respectfully asked to exhibit "G," showing how the railroads of Ohio are equipped with train-brakes—over 89 per cent. of all the baggage, express, mail

and passenger cars, used on the Ohio roads, having some kind of continuous brake. This showing is greatly to the credit of Ohio railway management, and may largely account for the comparatively low per cent. of casualties in train accidents other than collisions.

Again, the rapid improvement of permanent way, remarked by the Civil Engineers in the past summer's examination, will also go to show that there should be fewer dangerous derailments, and other train accidents (excepting collisions) than in the States at large.

There is, therefore, one important question evidently before your honorable body: "The proper means of lessening the alarming fatalities and injuries resulting from collisions." Therefore, as to

### (3) FURTHER LEGISLATION NECESSARY,

It is respectfully answered that legislation calculated to cause the establishment of the "*Absolute or Positive Block System*" of railroad management will, with the present known means, most effectually accomplish this end.

This system is established in part upon many lines of railway in the United States, and has been for many years in use in the United Kingdom of Great Britain.

With the present system of communicating by telegraph, each line of rails of a railway is divided into telegraph districts, and it is a rule that no two trains shall be on one district or division of rails at one time. It is the preserving of an interval of *space* between trains. It was the attempt to preserve an interval of *time* between trains that caused the terrible disaster upon which your inquiry is founded. Even when a strict system of signals is established on the latter method between one signalling station and another, an engine may break down, or the train may be in many ways prevented from running accurately to time, and thus, though all the time signals may have been correctly exhibited, and a proper interval of time may have been observed between any train and the train following, when at the signalling station, yet before the first train reaches the succeeding signalling station the second train may have caught the first and run into it.

In order that you may better understand its origin and use, there is given below

### A BRIEF HISTORY OF THE "BLOCK SYSTEM."

So long ago as 1842, Sir W. F. Cook, of England, published an essay entitled "Telegraphic Railways," in which all the leading principles now involved in the Block System under consideration were fully discussed. In 1844 it was first estab-

lished on the Eastern Railway of England. The railway companies were slow in entering upon the use of the telegraph. But the increase of railway traffic, and the frequent occurrence of terrible collisions in tunnels and dangerous places, soon forced a resort to telegraphy, and soon thereafter the Block System gained ground steadily. In 1851, C. V. Walker, Telegraphic Engineer, introduced the Telegraphic Bell System, and for twelve years this system was eminently successful upon the South-eastern Railway where first established.

In 1853, Captain Galton, C. E., of England, in his report upon "accidents" to the Board of Trade, the Railway Commission of the United Kingdom, said: "The most efficient mode of securing an interval between trains, and of doing away with any possibility of collision to trains when between stations, is to divide the railway into portions, and not allow a train to enter upon a portion until the preceding train shall have left that portion. The length of these portions would be regulated by the amount of traffic. This mode of working could be effected by means of the electric telegraph instrument being placed at each station, or, if the stations were far distant, at intermediate places. It would probably be necessary for special wires to be appropriated for the purpose. I am of opinion that this mode of working the railway is deserving of the serious consideration of the directors, and that (if not considered desirable for the whole line) it might at least be introduced in those parts which are most exposed to danger from being on inclines or otherwise."

Again he says: "This method of working a railway appears to me to be the only method which can effectually secure in practice safety from collision between trains proceeding in the same direction, especially upon lines where the trains are numerous and where they travel at different rates of speed; and accidents from this cause have hitherto been more numerous than from any other cause."

These suggestions we find were annually made in like reports to the Board of Trade, urging the more general use of the system, or one similar to that introduced by Mr. C. V. Walker, the Telegraphic Engineer of the South-eastern Railway.

The Board of Trade were constantly urging upon Parliament the need of enforcing the more general adoption of the Block System by railroads, and a select committee was appointed by Parliament, in 1858, to take testimony as to its efficiency.

#### WORKING OF THE BLOCK SYSTEM IN ENGLAND.

The committee above referred to, among other things, reported to Parliament as follows:

"That your committee has received much evidence with reference to the advisability of enforcing a system of telegraphic communication, and the utility of enacting that trains should not be dispatched without having ascertained by such communication that the line was clear.

"That your committee is not prepared to define the distance at which such telegraph stations should be placed, but it is of opinion that a recourse to this system would be a most effective means for the prevention of railway accidents, the largest proportion of which arise from collisions."

In 1873, when 38.7 per cent. of the total miles of railway in the Kingdom were worked on the absolute Block System, another select committee made a report to the House of Lords. As to the Block System, this committee reported:

"There is a general concurrence of opinion among the witnesses in favor of the Block System on all important railways which carry passengers.

"Some witnesses stated that these precautionary arrangements and mechanical appliances tend to lessen the sense of responsibility in the engine drivers. Such an effect may have been produced, but nevertheless the advantages resulting from the introduction of these systems are practically admitted by all the witnesses, and in the judgment of the committee decidedly preponderate."

In the report upon accidents for the year 1880, made by Henry G. Calcraft, he says:

"The improper system of block working, by which trains on different railways may approach a junction simultaneously, has been, during the present year as well as in the past years, a fruitful source of accident.

"The Block System, or its proper working on some lines, would most probably have prevented several of the accidents.

"In no less than forty-seven out of the one hundred and eighteen inquiries into train accidents, either the insufficiency of the brake power under the control of the driver, or his inability from the nature of the brake, such as the sectional brake, to apply it instantaneously throughout the length of the train, have been noticed.

"The importance of trains being supplied with continuous brakes, under the control of the engine driver, cannot but be evident from the enquiries of the past years.

"At the present time it may be said that the safety of railway traveling has been greatly enhanced from year to year by the improvements above referred to, notwithstanding the greatly increased traffic on the railways and the large length of new railways opened."

His tables may be summarized thus: The length of railway increased since 1873, 11 per cent.; tonnage of merchandise, 23 per cent.; passengers carried, 32 per cent.; miles traveled, 22 per cent.; accidents, decreased, 30 per cent.; collisions, decreased, 47 per cent.; during the time the absolute Block System has increased 26 per cent.; the total mileage in Absolute Block System increased to 64.8 per cent., and in England alone, to 75.6 per cent. Upon the double track railways in the United Kingdom 87.9 per cent. is worked by this system. Mr. Calcraft concludes his report in the following words:

"The fatal accidents of this year show a somewhat increased proportion to traffic when compared with the previous year, but a much smaller proportion than in most former years. They show, too, that no amount of mechanical appliances will operate as a complete protection against the consequences of human negligence, or dispense with the most important of all appliances, an efficient and well ordered staff of employees. But the tables given show that the gradual and partial adoption by railway companies of the Block System, and of interlocking points and signals, so long urged in Parliament and by the Government, has been concurrent with a decrease in the number of accidents, and that efficient mechanical appliances, so far from increasing the risks arising from human negligence, tends to diminish them.

"It is to be hoped that similar results will soon be obtained by the further adoption of efficient continuous brakes, a species of appliance which has special advantages, since it not only enables the railway servants to avoid accidents, but also when

in consequence of negligence, or other circumstances, an accident has become inevitable, enables them to minimize its consequence."

His tables, showing the growth of the Absolute Block System, since 1873 to 1880, and the percentage of decrease of accidents, is herewith submitted and marked "C."

It will be seen from the quotations from Mr. Calcraft's report, as cited above, that he considers that the next essential for the safety of passenger trains, after the establishment of the Block System, is the general use of Continuous Brakes. These reports to the Board of Trade have been, from year to year, demanding the use of the brakes now so generally used in Ohio—that is, a continuous brake, under the direct control of the engine driver. English management has been reluctant to adopt American propositions in the Westinghouse, Eames and other patents, but under pressure of the "accident reports" annually made to Parliament, by command of Her Majesty, they are rapidly equipping with this great means of safety. The Ohio management is well equipped with the "continuous train brake," but sadly short of the Block System, so highly credited by the best railroad management of the world.

Again reverting to the disaster under consideration, American authority is cited, and the following from an editorial in the Railroad Gazette, of January 20, 1882, is most pertinent:

"The testimony, which may be found in British reports, establishes, in a very conclusive way, that the Block System is an effective means of preventing, or diminishing, to a very great degree, accidents from rear collisions. It follows, then:

"1. That the New York Central, and many other railroads, depend for protection from rear collisions upon rules which it has been shown, a great many times, it is practically impossible to enforce with any reasonable degree of certainty.

"2. The road named has not adopted a system which the clearest evidence shows to be practically effective in diminishing, if not entirely preventing accidents from rear collisions, especially on lines with many trains which run at different speeds.

"3. The neglect of their employes does not release the New York Central Company from the terrible responsibility for the late accident, when it is apparent that neglect must be expected, and when well known and effective safeguards to protect the public against the consequence of such neglect have not been provided."

Again, to bring evidence more closely related to us, the following is offered as expressing the opinion of an engineer in charge of the inspection of the Lake Shore and Michigan Southern, concerning the Block System upon that most excellent railway:

"There has been used, since November, 1880, for block on main lines between Buffalo and Cleveland (183 miles, all double track), a semaphore signal at each station, with telegraph communication from one station to another.

"They have also had between Cleveland and Chicago a 'Block System' for the past five years for the government of their passenger and freight trains. Upon all heavy traffic parts of their road this system is in daily use. Their rules are to keep all passenger trains one station apart; as soon as a train leaves a station the operator turns his block, or semaphore, against all trains going in the direction of the departing train; and not until the departing train's arrival and departure at the next



station—which is announced upon the wire—does he remove the block or semaphore to allow another train to proceed in the same direction.

“The next operator then goes through the same operation, followed by all until the train arrives at its destination. This method is termed a *positive block*.

“Freight trains are allowed to follow each other according to circumstances. They may be blocked ten, fifteen or twenty minutes apart—that is, they can leave a station the time apart indicated, by being blocked by the telegraph operator, under orders of the dispatcher; and all conductors keep ten, fifteen or more minutes behind each train or section. This method is called a ‘*permissive block*.’

“As to their ability to obtain a strict compliance with these blocking rules—in the case of passenger trains it may be said that they rarely have rear collisions; of course, as long as they depend upon humanity, some one may be liable to break rules, but their system is considered as safe as any.

“In the case of freight trains, one section may break down, a failure upon the part of the conductor or brakeman, in not getting out signals the proper distance, an engineer by careless running may cause a rear end collision.

“Without such rules as enumerated, they could not safely conduct their railway train service. Rules vary in regard to freight trains according to circumstances or the weather, using a longer time in blocking apart in boisterous or stormy weather.

“Our judgment and the observations we have made upon the Lake Shore and Michigan Southern Railway, show that the ‘Block System’ is the only one that can, in a large measure, obviate accidents, especially upon railways of any great magnitude, and where trains are run with great speed and closely together.”

To make the evidence still more conclusive as to the value of this system recommended, attention is again called to exhibit “D,” and to the train accidents occurring on the Lake Shore for the year ending June 30, 1881.

It will there be seen that not a single “collision” occurred to its passenger trains during their transit through Ohio, and but a single accident to its passenger trains in Ohio, and that a derailment. What more conclusive evidence could be offered as to the value of a system, than such results following its use? It may be well to state that the passenger mileage of this road is more than that of any other road reporting in Ohio; in fact, over twelve per cent. of all the passenger mileage of Ohio roads.

There is one other point outside of the Block System that perhaps ought to be considered as a means of avoiding collisions at crossings. This is the “Interlocking Switch and Signal System,” now being adopted at various points in the United States. These means greatly facilitate the rapid and safe transit of railroad traffic, and insures perfect safety against crossing collisions.

It may be stated as to the extent and accomplishment of this Interlocking Switch and Signal System, that the number of these “machines” in operation within the United States, January 1, 1882, was fifty-two, distributed as follows:

Pennsylvania Railroad (main line).....	10
United Railroads of New Jersey.....	6
Northern Central Railroad.....	2
Baltimore and Potomac Railroad.....	1
Philadelphia and Erie Railroad.....	1



Baltimore and Ohio Railroad.....	2
Long Island Railroad.....	5
Manhattan Elevated Railroad .....	12
Brooklyn, Flatbush and Coney Island Railroad.....	1
New York Central and Hudson River Railroad .....	3
Boston and Albany Railroad .....	1
Boston and Lowell Railroad .....	1
Pittsburgh, Cincinnati and St. Louis Railroad.....	1
Chicago, Milwaukee and St. Paul Railroad.....	1
Chicago, Burlington and Quincy Railroad.....	1
Cleveland, Columbus, Cincinnati and Indianapolis Railway.....	1
Cincinnati Southern Railroad.....	1
New Jersey Central Railroad.....	1
Troy, Greenfield & Housatonic Railroad .....	1

As to the cost of maintaining "interlocking," it may be said that the machine at East Newark, N. J., the oldest one in this country, has cost so little as not to be worthy of mention. From information coming from the Superintendent of the Pennsylvania Railroad, the machine put in at East Liberty in 1878 has not cost five dollars for repairs up to this time. The engineer in charge of the Northern Central Railroad, reports that less than a dollar has been expended for repairs on the twenty-lever machine put in at Baltimore, Maryland, in the same year.

The capacity and safety of these machines are illustrated by the following facts: At the station at Broad street, Philadelphia, on the Pennsylvania Railroad, 432 trains pass daily, in and out; the setting of the 28 switches and 29 signals is performed by one machine of 56 levers operated by two men. At the 127th street and Third Avenue station, on the elevated railroad, New York city, nearly 500 trains pass in and out during the twenty-four hours; the setting of the 12 switches and the giving of the 10 signals for governing the motion of these trains, are accomplished by one man working a machine of 22 levers. During the busiest hour of the day forty trains per hour pass in and out at this station. At Clapham Junction, near London, England, there has been for about two years a machine directly signalling the movements of the 670 trains passing daily.

The Interlocking System has been frequently used in England and on the continent as a Block System. Also at Philadelphia the same result is obtained: Trains leave 14th street station under guidance of signals given at 17th street, proceed to 20th street, 1,200 feet distant, where the engine drivers are informed by a second machine that the track is clear to 30th street, 2,500 feet further on, at which a third machine is placed, which in turn gives information concerning the track up to the fourth machine situated on 32d street. In this manner the road is divided into block sections, and but one train is permitted to enter the block at one time. Accidents resulting from the failure of these machines have been very rare.

An insight into the working of this system as an Interlocking System may be gained at Berea, Ohio, on the C., C., C. & I. Railway, and upon the great iron railroad bridge on the Cincinnati Southern Railway at Cincinnati, O.

To this and the "Absolute Block System" of the Lake Shore and Michigan Southern Railway, legislative attention is most respectfully directed.

Now, in conclusion, more fully to answer the final interrogatory of the resolutions: "That if any further legislation is necessary?" without presuming to formulate any measure, a matter left to the varied wisdom of your honorable body, it is respectfully answered in general terms, such legislation is desirable as will secure, annually, a thorough investigation of all railway accidents, the cause of which is not palpable—an inquiry to determine whether it is the result of management or not; a statement as to the better means that might have been employed—a careful and intelligent report to be annually made as to every physical feature of each road in Ohio; and a proper presentation of all such facts to the public. It is believed that such aid to a just and proper public opinion will serve as a most effective means to advance rapidly the railroads of this State to that high condition of safety so much desired by the twenty millions of passengers that annually trust their persons and lives upon railways in Ohio.

It is not urged that there shall be statute penalties to enforce views, since the penalty, inflicted by an intelligent, unfavorable public opinion, upon a management that is neglectful of proper means, indifferent to, or tardy in the adoption of the best means to make safe the persons and lives of passengers, is far more reaching and corrective in its effects than any penalties for non-conformity that can be secured by process of law.

It is, perhaps, no more than proper and just to say that the three efficient Civil and Mechanical Engineers, who have made an examination into the physical condition of the railroads of the State, during the past summer, unite in saying that upon many of the roads of Ohio the managements were distinguished by an earnest, active and intelligent purpose steadily to push the improvements of their ways to the highest condition; and it is believed that all such will heartily co-operate with the State in any intelligent means calculated to move all the railways of the State to the consummation so much desired.

These statements and views, together with accompanying statistics, are most respectfully submitted in answer to the resolution of your honorable body.

I have the honor to be, sir,

Your obedient servant,

H. SABINE,

*Commissioner of Railroads and Telegraphs.*

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## EXHIBIT "A."

## NAME, HOW OPERATED, AND METHOD OF HEATING.

Alliance and Lake Erie Railroad (Company)—Stoves.

Baltimore and Ohio Railroad Company—

Baltimore and Ohio and Chicago Railroad (stock ownership)—Baker's patent heaters and wood stoves with door locks.

Central Ohio Railroad (under lease)—Baker's patent heaters and wood stoves with door locks.

Newark, Somerset and Straitsville Railroad (under lease)—Baker's patent heaters and wood stoves with door locks.

Sandusky, Mansfield and Newark Railroad (under lease)—Baker's patent heaters and wood stoves with door locks.

Bellaire and Southwestern Railway (Company)—Stoves well secured, heated with coal.

Bowling Green Railroad (Lessee)—According to law.

Chagrin Falls and Southern Railroad—Company (from February 1, 1881)—Common coal stove for burning soft coal.

Cincinnati and Eastern Railway (Company)—Iron stoves securely bolted together and to the floor, and which do not permit escape of fire.

Cincinnati, Georgetown and Portsmouth Railroad—Company (from September 13, 1880)—Coal stoves.

Cincinnati, Hamilton and Dayton Railroad (Company)—Wood or coal, part with Baker heaters.

Cincinnati, Hamilton and Indianapolis Railroad (stock ownership)—Wood and coal.

Cincinnati, Richmond and Chicago Railroad (lease)—Wood and coal.

Dayton and Michigan Railroad (lease)—Wood and coal, part with Baker heaters.

Cincinnati, Indianapolis, St. Louis and Chicago Railway (Company)—Part by water base stoves in each end of car, with arrangement so that the fire would be extinguished should car be overturned; and part (new cars) by Baker's patent heater.

Harrison Branch Railroad (under lease)—Part by water base stoves in each end of car, with arrangement so that the fire would be extinguished should car be overturned; and part (new cars) by Baker's patent heater.

Cincinnati Northern Railway (Company)—Coal stoves.

Cincinnati Railroad Company—

Cincinnati Southern Railway (under license)—Baker and Smith's heaters.

Cincinnati, Sandusky and Cleveland Railroad—Company (till May 1; leased to I., B. & W.)—Stoves.

Columbus, Springfield and Cincinnati Railroad (till May 1; leased to I., B. & W.)—Included in C. S. & C.

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- Cincinnati, Van Wert and Michigan Railroad (by C., V. W. & M. C. C. Co., from March 5; construction contract)—Stoves.
- Cincinnati and Westwood Railroad (Company)—By coal stoves bolted to floor.
- Cleveland, Columbus, Cincinnati and Indianapolis Railway (Company)—Winslow and Baker heaters, and safety stoves.
- Cincinnati and Springfield Railway (under lease)—Winslow and Baker heaters, and safety stoves.
- Cleveland and Marietta Railroad (Company)—A. P. Winslow safety car stoves.
- Cleveland, Mt. Vernon and Delaware Railroad (Receiver)—Most coaches heated by the "Spear" patent heaters.
- Cleveland, Painesville and Ashtabula Railroad (Company)—Not reported.
- Cleveland, Tuscarawas Valley and Wheeling Railway (Company)—Bissell safety car stove.
- College Hill Railroad—Company (from May 1, 1881)—Stoves.
- Columbus and Hocking Valley Railroad (Company)—Patent car stove.
- Columbus and Maysville Railway (Company)—Not reported.
- Columbus and Toledo Railroad (Company)—Patent car stove.
- Columbus, Washington and Cincinnati Railroad (Receiver)—Coal burning safety stoves.
- Connotton Valley Railway (Company)—Stoves.
- Dayton and Southeastern Railroad—Receiver (till May 21; then consolidated with T. D. & B. R. R.)—Not reported.
- Dayton and Union Railroad (Trustee)—Winslow safety stove.
- Eastern Ohio Railroad (Lessee)—Passenger cars heated by coal stove.
- Indiana, Bloomington and Western Railway Company—Not reported.
- Cincinnati, Sandusky and Cleveland R. R. } Ohio Division (from May 1.)  
Columbus, Springfield and Cincinnati R. R. }
- Iron Railroad (Company)—Beeman patent railroad stove, claimed to be so constructed that the fire will be extinguished as soon as the car is overturned.
- Lake Erie and Western Railway (Company)—Spear stoves; hard coal.
- Lake Shore and Michigan Southern Railway (Company)—Baker and Smith's heaters, with hot-water pipes, in passenger cars. Smoking and baggage cars, strong stoves, generally the Winslow safety stove.
- Chicago and Canada Southern Railway (by stock ownership and special agreement)—Baker and Smith's heaters, with hot-water pipes, in passenger cars. Smoking and baggage cars, strong stoves, generally the Winslow safety stoves.
- Mahoning Coal Railroad (under lease)—Baker and Smith's heaters, with hot-water, pipes in passenger cars. Smoking and baggage cars, strong stoves, generally the Winslow safety stove.
- Marietta and Cincinnati Railroad (Receiver)—Wood stoves and Baker heaters.
- Baltimore Short Line Railway (special agreement)—Wood stoves and Baker heaters.
- Cincinnati and Baltimore Railway (special agreement)—Wood stoves and Baker heaters.
- New York, Pennsylvania and Ohio Railroad (Company)—Wood stoves and

Winslow safety and Baker heaters, for anthracite coal, all well protected with zinc in day coaches. Baker heaters in sleeping, hotel and parlor cars.

Cleveland and Mahoning Valley Railway (under lease)—Wood stoves and Winslow safety and Baker heaters, for anthracite coal, all well protected with zinc in day coaches. Baker heaters in sleeping, hotel and parlor cars.

Ohio Central Railroad (Company)—Baker heater and Spear's stoves.

Ohio and Mississippi Railway (Receiver)—Baker heater and Spear's coal stoves.

Ohio and West Virginia Railway (Company)—Patent car stove.

Painesville and Youngstown Railway (Company)—Coal stoves using bituminous coal.

Paulding and Cecil Railway (Company)—Stove.

Pennsylvania Company—

Ashtabula and Pittsburgh Railway (under lease)—Dripp's and Spear's patent safety stoves.

Cleveland and Pittsburgh Railroad (under lease)—Bissell & Co., safety heaters, 28; Winslow, 1; James Spear, 4; Dripp's 2.

Lawrence Railroad (under lease)—By Dripp's and Spear's and Bissell's safety stoves.

Massillon and Cleveland Railroad (under lease)—By Dripp's and Spear's and Bissell's safety stoves.

North Western Ohio Railway (under lease)—Spear's patent anthracite coal burner.

Pittsburgh, Ft. Wayne and Chicago Railway (under lease)—By Dripp's and Spear's and Bissell safety stoves.

Pittsburgh, Cincinnati and St. Louis Railway (Company)—Winslow's and Bissell's patent stoves.

Cincinnati and Muskingum Valley Railway (under lease)—Coal stoves. Dripp's and Winslow's patent.

Columbus, Chicago and Indiana Central Railway (under lease)—Passenger cars, wood and coal stoves, Spear's and Dripp's heaters. Sleeping, parlor and drawing-room cars are heated by Baker's patent car warmers and Winslow stoves.

Columbus and Xenia Railroad (under lease)—Included under L. M.

Little Miami Railway (under lease)—Dripp's and Winslow's patent stoves.

Pittsburgh and Lake Erie Railroad (Company)—Anthracite coal stoves with hot air flues.

Rocky River Railroad (Company)—Coal stoves well secured.

Scioto Valley Railway (Company)—Spear's patent heaters.

Springfield Southern Railroad (Company)—Soft coal stoves.

St. Clairsville Northern Railway (Company)—Common car stove.

St. Clairsville Railway (Company)—Common car stove.

Toledo, Ann Arbor and Grand Trunk Railway—Company (from October 15)—James Spear & Co., patent Anti-Clinker car heater, No. 16 coal stove.

Toledo, Canada Southern and Detroit Railway (by C. S. R'y Co.; stock ownership)—Baker and Smith heaters.

Toledo, Delphos and Burlington Railroad (Company)—Spear stoves, using anthracite or bituminous coal

Valley Railway (Company)—Winslow safety car stove.

Wabash, St. Louis and Pacific Railway (Company)—Not reported.

## EXHIBIT "B."

### NAME, HOW OPERATED, AND METHOD OF LIGHTING.

Alliance and Lake Erie Railroad (Company)—Oil-lamps.

Baltimore and Ohio Railroad Company—

Baltimore and Ohio and Chicago Railroad (stock ownership)—Mineral sperm oil and candles.

Central Ohio Railroad (under lease)—Mineral sperm oil and candles.

Newark, Somerset and Straitsville Railroad (under lease)—Mineral sperm oil and candles.

Sandusky, Mansfield and Newark Railroad (under lease)—Mineral sperm oil and candles.

Bellaire and Southwestern Railway (Company)—Candles.

Bowling Green Railroad (Lessee)—Sperm candles.

Chagrin Falls and Southern Railroad—Company (from February 1, 1881)—Side lamps, petroleum oil used.

Cincinnati and Eastern Railway (Company)—Lard oil and candles.

Cincinnati, Georgetown and Portsmouth Railroad (Company)—Candles.

Cincinnati, Hamilton and Dayton Railroad (Company)—Candles or oil.

Cincinnati, Hamilton and Indianapolis Railroad (stock ownership)—Oil and candles.

Cincinnati, Richmond and Chicago Railroad (lease)—Oil and candles.

Dayton and Michigan Railroad (lease)—Oil and candles.

Cincinnati, Indianapolis, St. Louis and Chicago Railway (Company)—Centre and side lamps, a non-explosive oil being used.

Harrison Branch Railroad (under lease)—Included in C., I., St. L. & C.

Cincinnati Northern Railway (Company)—Lamps.

Cincinnati Railroad Company—

Cincinnati Southern Railway (under lease)—Signal oil-lamps.

Cincinnati, Sandusky and Cleveland Railroad—Company (till May 1; leased to I., B. & W.)—Lamps.

Columbus, Springfield and Cincinnati Railroad (till May 1; leased to I., B. & W.)—Included in C. S. & C.

Cincinnati, Van Wert and Michigan Railroad (by C., V. W. & M. C. C. Co. from March 5; construction contract)—Candles.

Cincinnati and Westwood Railroad (Company)—B candles.

Cleveland, Columbus, Cincinnati and Indianapolis Railway (Company)—300° oil.

- Cincinnati and Springfield Railway (under lease)—300° oil.
- Cleveland and Marietta Railroad (Company)—Candles and lamps.
- Cleveland, Mt. Vernon and Delaware Railroad (Receiver)—Candles.
- Cleveland, Painesville and Ashtabula Railroad (Company)—Not reported.
- Cleveland, Tuscarawas Valley and Wheeling Railway (Company)—Mineral seal oil, 300 degrees.
- College Hill Railroad—Company (from May 1, 1881)—Candles.
- Columbus and Hocking Valley Railroad (Company)—Candles and lamps.
- Columbus and Maysville Railway (Company)—Not reported.
- Columbus and Toledo Railroad (Company)—Oil-lamps.
- Columbus, Washington and Cincinnati Railroad (Company)—300° fire-test carbon oil.
- Connotton Valley Railway (Company)—Oil-lamps.
- Dayton and Union Railroad (Trustee)—Candles fully protected.
- Eastern Ohio Railroad (Lessee)—Sperm candles.
- Indiana, Bloomington and Western Railway Company—Not reported.
- Cincinnati, Sandusky and Cleveland R. R. } Ohio Division (from May 1.)  
Columbus, Springfield and Cincinnati R. R. }
- Iron Railroad (Company)—Candles.
- Lake Erie and Western Railway (Company)—Lamps, mineral sperm oil.
- Lake Shore and Michigan Southern Railway (Company)—Candles in globes, and lamps burning kerosene of 300° fire-test.
- Chicago and Canada Southern Railway (by stock ownership and special agreement)—Candles in globes and lamps burning kerosene of 300° fire-test.
- Mahoning Coal Railroad (under lease)—Candles in globes, and lamps burning kerosene of 300° fire-test.
- Marietta and Cincinnati Railroad (Receiver)—Candles.
- Baltimore Short Line Railway (special agreement)—Candles.
- Cincinnati and Baltimore Railway (special agreement)—Candles.
- New York, Pennsylvania and Ohio Railroad (Company)—Mineral sperm or other 300° fire-test oil in metal lamps.
- Cleveland and Mahoning Valley Railway (under lease)—Mineral or other 300° fire-test oil in metal lamps.
- Ohio Central Railroad (Company)—Oil lamps and coach-candles.
- Ohio and Mississippi Railway (Receiver)—Candles and lamps.
- Ohio and West Virginia Railway (Company)—Oil and candles.
- Painesville and Youngstown Railway (Company)—Coach-candles and glass globes.
- Paulding and Cecil Railway (Company)—Run in daytime only.
- Pennsylvania Company—
- Ashtabula and Pittsburgh Railway (under lease)—Candles and lard-oil.
- Cleveland and Pittsburgh Railroad (under lease)—Candles.
- Lawrence Railroad (under lease)—Candles and safety oil-lamps.



Massillon and Cleveland Railroad (under lease)—Candles and safety oil-lamps.

North Western Ohio Railway (under lease)—Oil and candles.

Pittsburgh, Ft. Wayne and Chicago Railway (under lease)—Candles and safety oil-lamps.

Pittsburgh, Cincinnati and St. Louis Railway (Company)—Candles or lamps with mineral sperm oil.

Cincinnati and Muskingum Valley Railway (under lease)—Candles and mineral sperm oil lamps.

Columbus, Chicago and Indiana Central Railway (under lease)—Candles and oil-lamps.

Columbus and Xenia Railroad (under lease)—Included in L. M.

Little Miami Railway (under lease)—300° fire-test mineral sperm oil.

Pittsburgh and Lake Erie Railroad (Company)—Candles and headlight oil, 300° fire-test.

Rocky River Railroad (Company)—Oil and candles.

Scioto Valley Railway (Company)—Candles and oil.

Springfield Southern Railroad (Company) Candles.

St. Clairsville Northern Railway (Company)—Spermaceti candles.

St. Clairsville Railway (Company) Spermaceti candles.

Toledo, Ann Arbor and Grand Trunk Railway—Company (from October 15)—Coach candles.

Toledo, Canada Southern and Detroit Railway (by C. S. R'y Co. ; stock ownership)—Candles.

Toledo, Delphos and Burlington Railroad (Company)—Most approved make of lamps, using mineral sperm oil.

Valley Railway (Company)—300° oil and candles.

Wabash, St. Louis and Pacific Railway (Company)—Not reported.

## EXHIBIT "C."

TABLE SHOWING THE GROWTH OF THE "ABSOLUTE BLOCK" SYSTEM IN THE UNITED KINGDOM SINCE 1873, AND THE DECREASE PER CENT. OF ACCIDENTS.

		Percentage of single line worked on the Absolute Block System.	Percentage of double or more lines worked on the Absolute Block System.	Percentage of total length of line worked on the Absolute Block System.	Percentage of accidents from collisions.
1873.	England and Wales	31.1	54.8	46.0	55.8
	Scotland .....	44.1	27.7	37.5	63.1
	Ireland .....		2.4	0.6	27.3
	Total.....	27.1	48.5	38.7	55.1
1874.	England and Wales	38.5	63.6	54.0	51.7
	Scotland.....	45.9	31.9	40.4	65.7
	Ireland.....		2.6	0.6	30.8
	Total.....	32.0	56.3	44.4	52.9
1875.	England and Wales	41.0	69.5	58.7	50.8
	Scotland.....	46.7	39.8	44.0	42.9
	Ireland.....	0.1	2.6	0.7	21.7
	Total.....	33.6	62.1	48.8	49.1
1876.	England and Wales	45.7	75.6	64.6	45.8
	Scotland.....	48.0	49.0	48.4	45.6
	Ireland .....	0.3	2.9	0.9	26.7
	Total.....	36.6	68.4	53.9	45.3
1877.	England and Wales	49.5	79.1	68.2	48.1
	Scotland.....	49.6	54.9	51.7	46.9
	Ireland.....	0.3	5.1	1.5	16.7
	Total.....	39.0	72.1	56.9	46.1
1878.	England and Wales	50.2	82.0	70.3	49.8
	Scotland.....	54.7	58.1	56.0	50.0
	Ireland .....	0.3	13.5	3.5	42.3
	Total.....	40.4	75.2	59.3	49.3
1879.	England and Wales	52.2	85.1	73.2	46.5
	Scotland.....	56.0	60.7	57.8	47.1
	Ireland.....	4.7	16.5	7.6	50.0
	Total.....	22.9	78.3	62.2	46.7
1880.	England and Wales	53.6	87.9	75.6	39.7
	Scotland.....	55.0	68.4	60.2	44.4
	Ireland.....	10.3	16.5	11.8	66.6
	Total.....	44.3	81.6	64.7	41.6

## EXHIBIT "D."

## COLLISIONS AND OTHER TRAIN ACCIDENTS, ETC.

NOTE.—These accidents are for entire line. The Lake Shore, Michigan Southern and the Wabash, St. Louis and Pacific, however, report for Ohio only. The accidents from coupling all took place in Ohio.

## Collisions.

Name of Road.	Date.	Train.	Kind.	Effect.	Persons Injured.	Extent of Injury.
A. & L. E. R. R.	No train accidents					
A. & P. R. V.	No train accidents					
B. & O., & C. R. R.	Sept. 10 Jan. 24 Feb. 25	Freight " "	Broke in two Rear Butting	5 cars damaged 1 engine and 1 car damaged 2 engines damaged	None Fireman None	Killed.
Baltimore Short Line	Included in M. & C. R. R.					
Bowling Green R. R.	No train accidents					
B. & S. W. R. V.	No train accidents reported					
C. V. Wt. & St. L. Ex. of C. & N. W.	No train accidents reported					
Central Ohio R. R.	July 10 July 23 July 30 Nov. 12 Nov. 20	Freight " " Freight and passenger	Switching Rear Switching Rear Butting	1 engine damaged 1 engine, 1 caboose, 10 box cars damaged 1 engine damaged 1 engine, 1 caboose, 3 box cars damaged 2 engines, 3 passenger cars damaged	None " " Engineer Brakeman Fireman	None Slightly injured. Killed. Slightly injured.
C. F. & S. R. R.	Nov. 30	Freight	Rear	1 engine 1 caboose, 1 box car damaged	2 passengers	Foot amputated.
C. & C. S. R. V.	Dec. 4	"	Butting	1 engine, 8 gondolas, 3 flat-cars damaged	Engineer	Slightly injured.
Cin. & Balt. R. V.	Dec. 5	"	Butting	1 engine, 3 box cars damaged	Brakeman	Leg and thigh broken.
Cin. & Eastern R. V.	Jan. 6	"	"	1 caboose, 3 box cars damaged	None	
Cin. Georgetown & P. R. R.	Feb. 17	"	Switching	1 engine, 1 gondola damaged	"	
C. H. & D. R. R.	May 4	"	Rear	1 box car, 1 caboose damaged	"	
	June 20	"	Broke in two	1 box car, 1 gondola, 1 flat car damaged	"	
C. F. & S. R. R.	No train accidents reported					
C. & C. S. R. V.	No train accidents					
Cin. & Balt. R. V.	Included in M. & C. R. R.					
Cin. & Eastern R. V.	No train accidents reported					
Cin. Georgetown & P. R. R.	No train accidents					
C. H. & D. R. R.	July 15 Aug. 29 Oct. 9 Sept. 29 Oct. 20 Oct. 20 July 22 July 23 Sept. 1 Oct. 20	Freight Passenger and freight Freight Passenger and freight Passenger Freight Switch Freight Pass.	Rear " Crossing " Rear Butting "	Slight damage. No damage. Two cars destroyed Freight cars wrecked Cars and engine destroyed Slight damage. Flat car injured. Caboose damaged Cars scratched	None " " 15 passenger None " "	Injured, mostly scalded.
C. H. & I. R. R.						

EXHIBIT "D."—Continued.

Name of Road.	Date.	Train.	Kind.	Effect.	Persons Injured.	Extent of Injury.
C. H. & I. R. R.	Oct. 23 Nov. 10 Nov. 27 Feb. 15	Switch Freight Freight Freight	Butting " " "	Engine damaged. " Cars damaged. "	None " " "	..... ..... ..... .....
C. I., St. L. & C. R. R.	Not reported as to classify.	Passenger	Crossing	Engine seriously damaged.	1 passenger.	Injured slightly.
C. & M. V. R'y.	Nov. 9 June 4 No train accidents reported.	Freight Freight No train accidents reported.	Crossing " "	Engine, tender and 1 box car damaged. " "	None " "	..... ..... .....
Cin. Northern R. R.	Aug. 19	Freight	Butting	Engine and some cars damaged.	Engineer	Scalded.
Cin. & Portsmouth R. R.	Dec. 28	Freight and passenger	"	Engine damaged, baggage car burned.	Fireman	Killed.
Cin., Richmond & Chicago R. R.	Oct. 28	Freight	Butting	Draw-heads broken.	Engineer	Slightly.
Cin., Sandusky & Cleveland R. R.	Feb. 21	"	Rear	Engine car and caboose damaged.	One person.	Hurt.
Cincinnati Southern R'y.	Sept. 3	"	"	3 cars and caboose wrecked.	None	.....
Cincinnati & Springfield R'y.	Oct. 25	"	"	Engine damaged.	"	.....
	Jan. 7	"	"	"	"	.....
	Jan. 22	"	"	"	"	.....
	Jan. 29	"	"	"	"	.....
	May 7	"	Butting	Engine and several cars damaged.	"	.....
Cin., Van Wt. & M. R. R.	No train accidents.	No train accidents.	"	Engine damaged.	"	.....
Cincinnati and Westwood R. R.	June 1	Passenger and freight	"	Some cars badly damaged.	"	.....
Cleveland, Col., Cin. & Ind. R'y.	Oct. 22	Freight	"	1 engine and some cars damaged.	None	.....
	Nov. 17	"	"	Caboose and some cars damaged.	"	.....
	Jan. 15	Passenger	"	Engine damaged.	"	.....
	May 16	Freight	"	Nothing serious.	"	.....
	Aug. 29	"	"	Cars damaged.	"	.....
		"	"	Engine damaged.	"	.....
Cleveland & Mahoning Valley R'y.	Included in N. Y., P. & O. R. R.				Engineer	Killed.
Cleveland & Marietta R. R.	Not reported.				Fireman	Collar bone broken.
Clev., Painesville & Ashabula R.R.	Nov. 15	Freight	Rear	Engine and two cars damaged.	Brakeman	Leg sprained.
Cleveland & Pittsburg R. R.	Jan. 5	"	"	"	None	.....
	Jan. 28	"	"	2 engines	"	.....
	March 7	"	Rear	Engine and 1 " "	"	.....
	June 14	Passenger and pay	"	2 engines damaged.	"	.....
	June 16	Freight	Rear	Engine and caboose damaged.	"	.....
Clev., T. V. & Wheeling R'y.	Nov. 9	"	Butting	2 engines and five cars slightly damaged.	"	.....
	Dec. 7	"	Rear	7 draw-heads broken.	"	.....
College Hill R. R.	No train accidents.	No train accidents.	"	"	"	.....



EXHIBIT "D"—Continued.

Name of Road.	Date.	Train.	Kind.	Effect.	Persons Injured.	Extent of Injury.
Lake Shore & Mich. South. R'y.	May 31.	Freight		2 cars wrecked.	None	
Lafayette R. R.	None.	Passenger.		Engine damaged.	None	
Little Miami R'y.	Aug. 11.			2 cars off track.	None	
	Oct. 8.			" " "	"	
	Jan. 22.	Freight		3	"	
Mahoning Coal R. R.	Included in L. S. & M. S. R'y.					
Marietta & Cincinnati R. R.	July 17.	Freight.	Rear.	Engine and 7 cars damaged.	3 passengers.	Slightly injured.
	July 25.	Freight	Crossing.	1 freight car damaged.	None.	
	Aug. 9.	"	"	3 cars destroyed, engine, 7 cars damaged.	None.	
	Aug. 12.	"	"	Engine and 9 cars slightly damaged.	"	
	Sept. 11.	"	"	" " 10 "	"	
	Sept. 13.	"	"	" " 2 cars damaged.	"	
	Oct. 25.	Switching.	"	" " 4 cars slightly damaged.	"	
	Oct. 27.	"	"	" " 5 "	"	
	Nov. 4.	Freight and express.	Crossing.	1 car slightly damaged.	"	
				Engine and 2 cars slightly damaged.	Engineer.	Killed.
				2 engines, 13 cars badly damaged.	Fireman.	Slightly injured.
					Conductor.	"
					Brakeman.	"
					Engineer.	"
					Fireman.	Killed.
					None.	
	Dec. 2.	Freight.	1 car.	Engine and 8 cars slightly damaged.		
	Dec. 8.	"	"	" " 4 "		
	Jan. 10.	"	"	Both engines slightly damaged.		
	Jan. 30.	Switching.	Crossing.	7 cars slightly damaged.		
	Feb. 15.	Freight.	"	Slight damages.		
	Feb. 19.	"	Rear.	2 cars destroyed, one damaged.		
	Feb. 23.	Switching.	Crossing.	2 cars badly damaged.		
	March 2.	Freight.	Rear.	2 " damaged, 2 engines slightly.		
	March 17.	"	"	2 engines and 3 cars slightly damaged.		
	May 28.	No accidents.		Engine and 3 cars slightly damaged.		
Massillon & Cleveland R. R.	Sept. 1.	No accidents.				
Newark, Somerset & St.ville R. R.	Oct. 16.	Freight.	Butting.	3 dumps and 4 gondolas damaged.	None.	
	Oct. 24.	"	"	9 " " 2 engines damaged.	"	
	Nov. 15.	"	"	1 box car damaged.	"	
	Jan. 11.	"	"	1 engine and 1 coal car damaged.	"	
	Feb. 5.	"	"	2 gondolas, 1 dump car damaged.	"	
	July 2.	Wild train.	Rear.	1 caboose and 2 box cars damaged.	"	
	Aug. 7.	Freight.	"		"	
	Nov. 24.	Construction.	"		"	
N. Y., Penn. & Ohio R. R.	Dec. 10.	Freight.	"		"	
	Jan. 18.	"	"		"	
	Feb. 12.	"	"		"	

## EXHIBIT "D"—Continued.

Name of Road.	Date.	Train.	Kind.	Effect	Persons Injured.	Extent of Injury.
N. Y. Penn. & Ohio R. R.	Jan. 7	Freight.			None	
North Western Ohio R'y	No train accidents.					
Ohio Central R. R.	March 3	Freight and engine.	Butting.	2 engines disabled, and 11 cars damaged	None	
	March 6	Fr't and construction.		Engine tender slightly damaged.		
	March 21	Fr't.		" pilot damaged.	"	
	March 25	Fr't and construction.	Butting.	2 engine pilots several draw-bars broke'n	"	
	March 29	"		Engine pilot and 2 draw-bars broken.	"	
	June 1	"	Butting.	2 engines and 6 cars wrecked.	"	
	June 2	"	"	2 eng's disabled, several draw-bars broke'n	None	
Ohio & Mississippi R'y	June 20	Fr't and passenger.		Caboose thrown from track.	"	
Ohio & West Virginia R'y	No train accidents reported.					
P. C. & Bridgeport R. R.	None	accidents reported				
Painesville & Youngstown R'y	None	accidents reported				
Paulding & Ocell R'y	None					
Pitts., Ft. Wayne & Chicago R'y	Aug. 7	Freight.	Rear.	0 cars badly damaged.	None	
	Aug. 16	"	"	1 engine, 2 cars broken, 3 cars off track.	"	
	Aug. 20	"	"	1 engine broken, 3 cars off track.	"	
	Oct. 4	"	"	1 car damaged.	"	
	Oct. 22	"	"	1 engine and 8 cars broken.	"	
	Oct. 30	"	"	2 cars broken.	"	
	Oct. 31	"	"	Engine and caboose broken.	"	
	Nov. 21	"	"	" 2 cars broken.	"	
	Dec. 13	"	"	3 cars broken.	"	
	Dec. 28	"	"	2 "	"	
	Jan. 1	"	"	2 "	"	
	Jan. 5	"	"	2 cars and engine broken.	"	
	Jan. 15	"	"	2 cars broken.	"	
	Feb. 9	"	"	Engine and 2 cars broken.	"	
	Feb. 16	Passenger and freight.	"	"	"	
	Feb. 22	Freight.	"	" 3 "	"	
	March 17	"	"	" 3 "	"	
	April 18	"	"	" 2 "	"	
	April 19	"	"	" 7 "	"	
	April 30	"	"	" 8 "	"	
	May 31	"	"	1 car broken.	"	
	June 2	"	"	Engine and 4 cars broken.	"	
	June 26	"	Butting.	2 engines and 8 cars broken.	"	
	June 27	"		Engine and 2 cars broken.	"	
	Aug. 27	"	Rear.	3 cars badly damaged.	"	
	Aug. 27	"	"	4 cars slightly damaged.	"	
	Sept. 4	"	Butting.	2 engines and 7 cars badly damaged.	"	
	Oct. 9	"	Rear.	3 cars damaged.	None	
	Nov. 7	"	"	2 cars damaged.	"	
	Dec. 7	"	Crossing.	Engine and car damaged.	"	
	Dec. 30	"	Crossing.	Engine and car damaged.	"	







## EXHIBIT "D"—Continued.

## Other train accidents resulting in injury to persons.

Name of Road.	Date.	Train.	Character of Accidents.	Persons Injured.	Extent of Injury.	Killed.	Injured.	Accidents from coupling in Ohio.
B. & O. & C. R. R.	Sept. 5	Freight	Engine thrown from track by a cow	Engineer	Killed			
Central Ohio R. R.	Feb. 3	Freight	Flue burst.	Fireman	Injured		2	
C. H. & D. R. R.	None		None				5	
C. H. & I. R. R.	None		None				6	
C. & M. V. R'y.	None		None				2	
Cin., Richmond & Chicago R. R.	None		None				5	
Cin., Sandusky & Cleveland R. R.	Nov. 7	Passenger	Broken rail.	One passenger	Burned			
Cin. Southern R'y	Feb. 4	"	"	"	Slightly			
"	Nov. 11	Freight	Slide	brakeman	Killed			
Cin. & Springfield R'y	Feb. 11		Brake-wheel broke.	One passenger	Badly hurt.		4	
Clev., Col., Cin. & Indianapolis R'y	Nov. 12	Passenger	Derailment.	Six passengers	Seriously injured.		4	
"	Feb. 4		"	Two	Killed			
Cin. & Springfield R'y	Oct. 16	Mixed	"	Engineer	Killed	1	17	
Clev., Col., Cin. & Indianapolis R'y	May 7	Freight	"	Fireman	Injured			
Cleveland and Pittsburgh R. R.	Dec. 3	Passenger	Derailment	Four passengers	Slightly injured	1	9	
Clev., Tus. Valley & Wheeling R'y	None			Engineer		1	17	
Cleveland, Chicago & Ind. Cen. R'y.	June 24	Mixed	Derailment		Leg burned and bruised			
Dayton & Michigan R.R.	None			Engineer	Killed			
Iron R. R.	None		Derailment	Engineer	Killed	3	7	
Lake Erie & Western R'y	March 22	Passenger	Derailment.	Fireman	Killed		13	
Lake Shore & Michigan South'n R'y				2 Ex messengers	Badly bruised			
				Mail clerk	Badly bruised.			
Lawrence R. R.	None						1	
Little Miami R'y.	Oct. 20						15	
Marietta & Cincinnati R. R.	Nov. 22		Loose rail turning over	Conductor	Slight			
"	Dec. 8		Broken rail		Slight		16	
"	Feb. 5		"	Brakeman	Slight			
"			"	Conductor	Slight			
"			"	Passenger	Leg broken			
"			"	Brakeman	Slight			
Newark, Somerset & Stralistsville R.R	Nov. 31	Passenger	Engine side-rod broke.	Engineer	Killed	1	16	
N. Y., Pennsylvania & Ohio R. R.						1		
North western Ohio R'y						1	2	
Ohio Central R. R.							1	
Ohio & Mississippi R'y	None						1	
Ohio & West Virginia R'y	None							
Painesville & Youngstown R'y	None							
Paulding & Cecil R'y	None							
Pittsburgh, Ft. W. & Chicago R. R.	Sept. 23	Mixed	Broken axle.	12 persons	Injured		8	
Pittsburgh, Cin. & St. Louis R'y	Oct. 7	Freight	Train breaking	1 person	Injured			

# EXHIBIT "D"—Continued.

## COMMISSIONER OF RAILROADS

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Other train Accidents Resulting in Injury to Persons.					Accidents from coupling in Ohio.	
Name of Road.	Date.	Train	Character of Accidents.	Persons Injured.	Extent of Injury.	Killed. Injured.
Pittsburgh, Cin. & St. Louis R'y .....	Oct. 18 .....	Freight .....	Wrong signal .....	1 person .....	Injured .....	.....
" .....	Jan. 10 .....	Freight .....	Axle breaking .....	2 persons .....	Injured .....	.....
Sandusky, Mansfield & Newark R.R. ....	Nov. 21 .....	.....	Engine blew crown-sheet down .....	Engineer .....	Slightly injured .....	14
Scioto Valley R'y .....	None .....	.....	.....	Fireman .....	" .....	.....
Toledo, Delphos & Burlington R. R. ....	None .....	.....	.....	1 brakeman .....	" .....	3
Toledo, Canada So. & Detroit R'y .....	None .....	.....	.....	.....	.....	1
Wabash, St. L. & Pacific R'y .....	None .....	.....	.....	.....	.....	1
Total .....	.....	.....	.....	.....	.....	176

## ANNUAL REPORT.

## SUMMARY OF EXHIBIT "D."

Name of Road.	Collisions.						Casualties to persons from other train accidents.	
	Train.		Other. (d)	Property damaged.		Casualties to persons.		
	Passenger. (b)	Freight. (c)		Engines.	Cars. (e)	Killed.		Injured.
Alliance & Lake Erie R. R.	None							
Ashtabula & Pittsburgh R'y.	Included	3		3				
Baltimore and Ohio and Chicago R. R.	Included in M. & C.				6	1	None	1
Baltimore Short Line R. R.	None		R. R.					
Bowling Green R. R.	"	"						
Bellaire & Southwestern R'y.	"	"						
Celina, Van Wert & State Line Extension R'y.	1	11		10	44	1		
Central Ohio R. R.	No train accidents.		reported.					
Chagrin Falls & Southern R. R.	No train accidents.							
Chicago & Canana Southern R'y.	Included in M. & C.		R. R.					
Cincinnati & Baltimore R'y.	No train accidents.		reported.					
Cincinnati & Eastern R'y.	No train accidents.							
Cincinnati, Georgetown & Portsmouth R. R.	No train accidents.			1	(a) 4	15	None.	
Cincinnati, Hamilton & Dayton R. R.	3	2	3	2	(a) 4			
Cincinnati, Indianapolis & Indianapolis R. R.	1	4		2		1		
Cincinnati, Indianapolis, St. Louis & Chicago R'y.	1				1			
Cincinnati & Muskingum Valley R'y.	Not obtainable.							
Cincinnati Northern R. R.	No train accidents.		reported.					
Cincinnati & Portsmouth R. R.	No train accidents.							
Cincinnati, Richmond & Chicago R. R.	None							
Cincinnati, Sandusky & Cleveland R. R.	1				2	2		2
Cincinnati, Southern R'y.		3		1	6	1	1	1
Cincinnati & Springfield R'y.				4	(a) 4			
Cincinnati, Van Wert & Michigan R. R.	No train accidents.							
Cincinnati & Westwood R. R.	2		reported.	3	(a) 6	1	1	6
Cincinnati, Columbus, Cincinnati & Indianapolis R'y.	Included in N. Y. & P.		& O. R. R.				None.	
Cleveland & Mahoning Valley R'y.	None							
Cleveland & Marietta R. R.	Not reported.							
Cleveland, Mt. Vernon & Delaware R. R.	1	5						
Cleveland, Painesville & Ashabula R. R.	2	2						
Cleveland & Pittsburgh R. R.	No train accidents.							
Cleveland, Tuscarawas Valley & Wheeling R'y.	No train accidents.							
College Hill R. R.	No train accidents.							
Columbus, Chicago & Indiana Central R'y.	No train accidents.							
Columbus & Rocking Valley R. R.	No train accidents.							
Columbus & Mansville R. R.	Included in C. S. & C. R. R.							
Columbus, Springfield & Cincinnati R. R.	No train accidents.							
Columbus & Toledo R. R.	No train accidents.							
Columbus, Washington & Cincinnati R. R.	No train accidents.							

	Included in L. M. No train accidents.	R'y. 2 reported.	2					
Columbus & Xenia R. R.	No train accidents.	"						
Connocton Valley R'y	No train accidents.	"						
Dayton & Michigan R. R.	No train accidents.	"						
Dayton & Southeastern R. R.	No train accidents.	"						
Dayton & Union R. R.	No train accidents.	"						
Eastern Ohio R. R.	No train accidents.	"						
Harrison Branch R. R.	No train accidents.	"						
Indianapolis, Bloomington & Western R'y (Ohio Division)	No train accidents.	"						
Iron R. R.	No train accidents.	"						
Lake Erie & Western R'y	No train accidents.	"						
Lake Shore & Michigan Southern R'y	No train accidents.	"						
Lawrence R. R.	No train accidents.	"						
Little Miami R'y	No train accidents.	"						
Mahoning Coal R. R.	No train accidents.	"						
Marietta & Cincinnati R. R.	No train accidents.	"						
Massillon & Cleveland R. R.	No train accidents.	"						
Newark, Somerset & Stratsville R. R.	No train accidents.	"						
New York, Pennsylvania & Ohio R. R.	No train accidents.	"						
Northwestern Ohio R'y	No train accidents.	"						
Ohio Central R. R.	No train accidents.	"						
Ohio & Mississippi R'y	No train accidents.	"						
Ohio & West Virginia R'y	No train accidents.	"						
Painesville, Canton & Bridgeport R. R.	No train accidents.	"						
Painesville & Youngstown R'y	No train accidents.	"						
Paulding & Cecil R'y	No train accidents.	"						
Pittsburgh, Cincinnati & St. Louis R'y	No train accidents.	"						
Pittsburgh, Ft. Wayne & Chicago R'y	No train accidents.	"						
Pittsburgh & Lake Erie R. R.	No train accidents.	"						
Rocky River R. R.	No train accidents.	"						
Sandusky, Mansfield & Newark R. R.	No train accidents.	"						
Scioto Valley R'y	No train accidents.	"						
Springfield Southern R. R.	No train accidents.	"						
St. Clairsville Northern R'y	No train accidents.	"						
St. Clairsville R'y	No train accidents.	"						
Toledo, Ann Arbor & Grand Trunk R'y	No train accidents.	"						
Toledo, Carada Southern & Detroit R'y	No train accidents.	"						
Toledo, Delphos & Burlington R. R.	No train accidents.	"						
Valley Railway	No train accidents.	"						
Wabash, St. Louis & Pacific R'y	No train accidents.	"						
Totals	(a) 24	(a) 163	(a) 14	151	502	15	62	7 43

(a) The sum of these three columns equals 201. The whole number of collisions as given by Exhibit "F" is 215. The discrepancy arises from some companies failing to report the collisions in such a manner as that they could be put in this table.

(b) Includes all collisions in which a passenger train was one of the colliding trains.

(c) Includes all collisions in which a freight train was one of the colliding trains, except those colliding with passenger trains.

(d) Includes collisions between engines, switching trains, etc.

(e) Includes all cars damaged, whether freight, passenger, baggage, express, caboose or dump cars.

## EXHIBIT "E."

## TRAIN ACCIDENTS FOR 1881, IN UNITED STATES.

(Tabulated from reports given in Railroad Gazette.)

NOTE.—Thirty-three of these accidents happened in Canada on roads running into the United States. They could not be readily eliminated from the table, and hence are included in it.

1881.	Collisions.						Derailments.						Other Accidents.						Totals.				Grand Total.			
	Train.			Casualties.			Totals.			Train.			Casualties.			Totals.			Accidents.			Casualties.				
	Passenger.	Passenger and Freight.	Freight.	Killed.	Injured.	Collisions.	Casualties.	Derailement.	Casualties.	Passenger.	Freight.	Killed.	Injured.	Accidents.	Casualties.	Passenger.	Freight.	Passenger and Freight.	Freight.	Killed.	Injured.	Accidents.		Casualties.		
Month.																										
January.....	6	14	32	10	34	52	44	73	77	20	146	159	166	17	4	.....	2	21	2	96	14	223	30	182	223	212
February.....	3	11	23	11	58	37	69	43	56	13	190	99	203	9	4	3	5	13	8	55	11	83	27	253	149	280
March.....	1	4	27	22	16	32	38	30	50	63	116	80	179	1	.....	.....	.....	1	.....	32	4	77	83	132	113	215
April.....	.....	6	10	2	6	16	8	20	23	20	55	43	75	1	3	.....	5	4	5	21	6	36	22	66	63	88
May.....	3	7	15	8	24	26	32	16	42	14	48	58	62	1	1	2	4	2	6	20	7	58	24	76	85	100
June.....	.....	5	15	11	21	20	32	16	35	20	57	51	77	1	1	.....	.....	2	.....	17	5	51	31	78	73	109
July.....	4	7	30	19	37	41	57	17	39	18	80	56	98	2	3	1	4	5	5	23	7	72	38	122	102	160
August.....	4	14	47	19	36	65	55	20	40	11	27	60	38	4	.....	1	4	4	5	28	14	87	31	67	129	98
September.....	5	18	62	27	127	85	154	17	38	23	94	55	117	2	2	6	6	4	12	24	18	102	56	227	144	283
October.....	2	12	37	16	52	51	70	24	53	12	77	77	89	1	2	1	4	3	5	27	12	92	31	133	131	164
November.....	4	15	39	39	61	58	100	23	49	11	59	72	70	2	1	.....	.....	3	.....	29	15	89	50	120	133	170
December.....	4	10	40	23	47	54	70	19	37	12	46	56	58	2	1	1	3	3	4	25	10	78	36	96	113	132
Totals.....	36	123	377	209	520	536	729	318	536	239	995	857	1232	43	22	15	37	65	52	397	123	1048	459	1552	1458	2011



## EXHIBIT "E."

## TRAIN ACCIDENTS FOR 1881, IN UNITED STATES.

(Tabulated from reports given in Railroad Gazette.)

NOTE.—Thirty-three of these accidents happened in Canada on roads running into the United States. They could not be readily eliminated from the table, and hence are included in it.

1881.	Collisions.						Derailments.						Other Accidents.						Totals.						Grand Total.
	Train.		Casualties.		Totals.		Train.		Casualties.		Totals.		Train.		Casual't.		Totals.		Accidents. Trains.		Casualties.				
Month.	Passenger.	Freight.	Killed.	Injured.	Collisions.	Casualties.	Passenger.	Freight.	Killed.	Injured.	Derailment.	Casualties.	Passenger.	Freight.	Killed.	Injured.	Accidents.	Casualties.	Passenger and Freight.	Freight.	Killed.	Injured.			
January.....	6	14	10	34	52	44	73	77	20	146	159	106	17	4	.....	2	21	2	96	14	223	30	182	223	212
February.....	3	11	23	58	37	69	43	56	13	190	99	203	9	4	3	5	13	8	55	11	83	27	263	149	280
March.....	1	4	27	16	32	38	30	50	63	116	80	179	1	.....	.....	.....	1	.....	32	4	77	83	132	113	215
April.....	.....	6	10	2	6	8	20	23	20	55	43	75	1	3	.....	5	4	5	21	6	36	22	66	63	88
May.....	3	7	15	8	24	32	16	42	14	48	58	62	1	1	2	4	2	6	20	7	58	24	76	85	100
June.....	.....	5	15	11	21	20	16	35	20	57	51	77	1	1	.....	.....	2	.....	17	5	51	31	78	73	109
July.....	4	7	30	19	37	41	17	39	18	80	56	98	2	3	1	4	5	5	23	7	72	38	122	102	180
August.....	4	14	47	19	36	65	20	40	11	27	60	38	4	.....	1	4	4	5	28	14	87	31	67	129	98
September.....	5	18	62	27	127	85	17	38	23	94	55	117	2	2	6	6	4	12	24	18	102	56	227	144	283
October.....	2	12	37	16	52	51	24	53	12	77	77	89	1	2	1	4	3	5	27	12	92	31	133	131	164
November.....	4	15	39	39	61	58	23	49	11	59	72	70	2	1	.....	.....	3	.....	29	15	89	50	120	133	170
December.....	4	10	40	23	47	54	19	37	12	46	56	58	2	1	1	3	3	4	25	10	78	36	96	113	132
Totals.....	36	123	377	209	520	536	318	536	239	995	857	1232	43	22	15	37	65	52	397	123	1048	459	1552	1458	2011



EXHIBIT "F"—SUMMARY OF TRAIN ACCIDENTS.

<sup>1</sup> Included in C., I., St. L. & C.

<sup>2</sup> Included in C. S. & C.

<sup>3</sup> Not reported.

<sup>4</sup> Included in L. S. & M. S.

<sup>2</sup> Causes of accidents effecting derailment of trains, causes of collisions, and causes of accidents not resulting in derailment of trains, not classified.<sup>2</sup> Causes of collisions not given.

<sup>7</sup> Included in Little Miami

<sup>a</sup> Included in M. & C.

<sup>a</sup> Causes of collision not given.

(a) None reported. (b) B

(k) This is cross classification.

(11) This classification does not agree with

(19) The difference between these and

(n) This discrepancy is the result of

(2) Time interval of acci

(12) TENSELY-KEVEN ACC

14. Seven collision.



EXHIBIT "G".

BRAKING EQUIPMENT AND MILLER PLATFORMS USED.

Name and how operated.	Total No. of pass., exp., baggage and mail cars.	No. of passenger exp., baggage and Platform.	No. of cars with train brakes.	Kind of Brake.
Alliance and Lake Erie R. R.—Company	2			
Baltimore and Ohio R. Co.	Equip'd	by B. & O. R.R.Co	All pass., bag e, exp. and mail	Loubridge air brake.
Baltimore and Ohio and Chicago R. R. (stock ownership).....	"	"	"	"
Central Ohio R. R. (under lease).....	"	"	"	"
Newark, Somerset and Stralville R. R. (under lease).....	"	"	"	"
Sandusky, Mansfield and Newark R. R. (under lease).....	"	"	"	"
Bellaire and Southwestern R'y—Company	4	"	"	Earnes vacuum.
Bowling Green R. R.—Company	2		4	Common.
Chagrin Falls and Southern R. R.—Company (from February 1, 1881)	1	All	4	Not reported.
Cincinnati and Eastern R'y—Com. any	9	"	4	Westinghouse air brake.
Cin., Georgetown and Portsm'n R. R.—Company (from Sept. 13, 1880)	48	"	35	"
Cincinnati, Hamilton and Dayton R. R.—Company	10	"	6	"
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership)	5	"	2	"
Cincinnati, Richmond and Chicago R. R. (lease)	19	"	15	"
Dayton and Michigan R. R. (lease).....	66	"	52	"
Cincinnati, Indianapolis, St. Louis and Chicago R'y—Company	Incl'd in	C., I., St. L. & C.	6	Westinghouse air brake.
Harrison Branch R. R. (under lease).....	Not given	None	42	"
Cincinnati Northern R'y—Company	40			Miller and Ransom.
Cincinnati R. R. Co.	Incl'd in	C. S. & C.	33	"
Cincinnati Southern R'y (under license).....	33	All	21	"
Cin., Sand'y and Clev. R. R.—Co. (till May 1; leased to I. B. & W.)				
Col. Springfield and Cin. R. R. (till May 1; leased to I. B. & W.)				
Cincinnati, Van Wert & Michigan R. R. (by C., V. W. & M. C. Co. from March 5; construction contract)	2	All	1	None
Cincinnati and Westwood R. R.—Company	92	All	92	Westinghouse air brake.
Cleveland, Columbus, Cincinnati and Indianapolis R'y—Company	22	All	22	"
Cincinnati and Springfield R'y (under lease).....	10	None	7	"
Cleveland and Marietta R. R.—Company	24		22	"
Cleveland, Mt. Vernon and Delaware R. R.—Receiver.....	Not reported			
Cleveland, Palmsville and Ashabua R. R.—Company	18	All	13	Westinghouse air brake
Cleveland, Tuscarawas Valley and Wheeling R'y—Company	20	None		Westinghouse air brake.
College Hill R. R.—Company (from May 1, 1881)	30	All	16	"
Columbus and Hocking Valley R. R.—Company	Equip'd	by Cin. E. R'y Co.	19	Westinghouse air brake.
Columbus and Maysville R'y—Company	20		15	"
Columbus and Toledo R. R.—Company	2	None		None
Columbus, Washington and Cincinnati R. R.—Receiver (till May 21).....	26		26	Westinghouse air brake.
Conotton Valley R'y—Company				
Dayton and Southeastern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.)	Not reported			
Dayton and Union R. R.—Trustee	5	All	3	Westinghouse air brake.

## EXHIBIT "G"—Continued.

Name and how operated.	Total No. of pass. exp., baggage and mail cars.	No. of passenger cars with Miller platform.	No. of cars with train brakes.	Kind of brake.
Eastern Ohio R. R. Lessee	1			Friction brake.
Indiana, Bloomington and Western R'y Co.				
Cin., Sandusky and Cleveland R. R. } Ohio Div. (from May 1)	See C. S. & C.			
Col., Springfield & Cincinnati R. R.	2	All		
Iron R. R.—Company	34	19	28	Hand brakes on every car.
Lake Erie and Western R'y—Company	277	"	277	Westinghouse automatic.
Lake Shore and Michigan Southern R'y—Company	1		1	"
C. and C. South'n R'y (by stock ownership and special agreement)		L. S. & M. S.		
Maioning coal R. R. (under lease)	49		49	Loughridge air brake.
Marietta and Cincinnati R. R.—Receiver	Incl'd in	M. & C.		
Baltimore Short Line R'y (special agreement)	Incl'd in	M. & C.	127	Westinghouse automatic.
Cincinnati and Baltimore R'y (special agreement)	153			
New York, Pennsylvania and Ohio R. R.—Company	18	N. Y., P. & O.		
Cleveland and Mahoning Valley R'y (under lease)	84	All	14	Westinghouse automatic.
Ohio Central R. R.—Company	6		78	Loughridge air brake.
Ohio and Mississippi R'y—Receiver	9		6	Westinghouse air brake.
Ohio and West Virginia R'y—Company	1			Hand brake.
Painesville and Youngstown R'y—Company				Not reported.
Paulding & Cedi R'y—Company				
Pennsylvania Company	5	Janney	5	Westinghouse aut. and air brake.
Ashabula & Pittsburgh R'y (under lease)	69	"	62	"
Cleveland and Pittsburgh R. R. (under lease)	13	"	13	"
Lawrence R. R. (under lease)	3	"	3	"
Massillon and Cleveland R. R. (under lease)	9	"	9	"
North Western Ohio R'y (under lease)	217	"	219	"
Pittsburgh, Ft. Wayne and Chicago R'y (under lease)	74	"	74	"
Cincinnati and Muskingum Valley R'y (under lease)	14	"	15	"
Columbus, Chicago and Todianna Central R'y (under lease)	95	"	90	"
Columbus and Xenia R. R. (under lease)	Incl'd in	L. M.		
Little Miami R'y (under lease)	42	Janney	48	Westinghouse aut. and air brake.
Pittsburgh and Lake Erie R. R.—Company	31	All	18	"
Rocky River R. R. Company	6	None		Hand brakes.
Scioto Valley R'y—Company	18	All	18	Westinghouse automatic.
Springfield Southern R. R.—Company	3		3	"
St. Clairsville Northern R'y—Company	Not reported	ted		
St. Clairsville R'y—Company	1	None		Common brake.
Toledo, Ann Arbor and Grand Trunk R'y—Company (from Oct. 15) ownership	5	All	5	Westinghouse air brake.
Toledo, Canada Southern and Detroit R'y (by C. S. R'y Co., stock ownership)	23	turn'd by C. S. R'y Co.	19	Westinghouse air brake.
Toledo, Delphos and Burlington R. R.—Company	17	All	17	"
Valley Railway—Company	265	"	163	"
Wabash, St. Louis and Pacific R'y—Company				Westinghouse air brake.

## EXHIBIT "H."

## ACCIDENTS WHICH HAVE RESULTED IN FIRE ON TRAINS IN THE UNITED STATES.

(From the R. R. Gazette).

*January.*

1881.

1. Jan. 27. Early in the morning, a freight train on the Wabash, St. Louis and Pacific ran into a preceding freight near Decatur, Ills., wrecking twelve cars. Five were burned up.
2. Jan. 21. Early in the morning, a passenger train on the Chicago, Rock Island and Pacific road struck a broken rail near Pond Creek, Ills., and three cars were thrown from the track and wrecked, and one car caught fire and was burned. One passenger was burned to death, another fatally hurt, the conductor and five passengers less severely injured.
3. Jan. 29. In the morning, a passenger train on the Sunbury and Lewiston Branch of the Pennsylvania was thrown from the track near Middleburg, Pa., by a broken rail. Two cars upset, were wrecked and burned up; five persons were badly, ten less severely, hurt.
4. Jan. 22. Near midnight on the 22nd, a passenger train on the New York, Lake Erie and Western was thrown from the track near Tioga Centre, N. Y. The postal car went down a bank with the baggage and express cars on top of it; the wreck caught fire and was burned up. Five men in the postal car were killed, all being burned to death, and in the other cars twelve were hurt. The accident is supposed to have been caused by a broken wheel.
5. Jan. 29. Early in the morning a freight train on the Grand Trunk ran off the track at Highland Creek, Ont., and ten cars went off the bridge and were wrecked. The wreck burned up; a boy was burned to death, and a brakeman hurt.
6. Jan. 22. In the evening, the baggage car of a passenger train on the New York and Greenwood Lake road caught fire when near Snake Hill, N. J., and was entirely destroyed.
7. Jan. 29. A flat car loaded with cotton on a freight train on Chicago, St. Louis and New Orleans road caught fire from a burning tree near McComb City, Miss., and four cars were burned.

*February.*

1. Feb. 22. In the afternoon, a special passenger car on the Buffalo, Pittsburgh and Western road ran into the rear of a regular passenger train, which was just starting from President, Pa. The engine of the special was damaged, and the rear car of the other train wrecked. Five passengers were badly and nine slightly hurt, most of them being scalded by steam from the locomotive.
2. Feb. 17. In the morning, the caboose of a freight train on the Wabash, St.



Louis and Pacific road was thrown from the track by a broken rail in East Hannibal, Ills., and went down a high bank, caught fire and was burned up. One man was killed and four hurt.

3. Feb. 24. In the morning, a passenger train on the Midland railroad, of New Jersey, struck a broken rail near Ogdensburg, N. J., and two cars left the track and upset down a bank. The cars caught fire and both were destroyed, but the passengers were able to get out without fatal results. Five trainmen and nine passengers were hurt, most of them but slightly.
4. Feb. 25. In the morning, an old iron bridge on the Illinois Central, near Heyworth, Ills., gave way under a freight train, and two cars fell into the ravine. They caught fire and were destroyed.
5. Feb. 10. In the evening of the 10th, two cars of a passenger train on the Central railroad, of New Jersey, jumped the track at Communipaw, N. J. One was thrown across the track; the other upset, caught fire and was burned up. Eight passengers were injured, besides a number slightly bruised.

*March.*

1. Mar. 8. In the morning, a freight train on the Western and Atlantic road ran into the rear of a preceding freight near McIvors, Ga. The engine and eight cars were badly broken, and the engine upset down the bank. The fireman was badly injured, and a man who stood by the track was caught under the engine and fatally scalded.
2. Mar. 16. In the night, an oil train on the Philadelphia and Reading road broke in two near Ringgold, Pa., and the rear section ran into the forward one, wrecking several cars. An oil-tank exploded and thirteen cars were burned up.
3. Mar. 21. In the morning, a passenger train on the St. Paul, Minneapolis and Manitoba road ran into the rear of a freight near Rothsay, Minn., wrecking several cars. The caboose caught fire and was burned. Two men were killed and five hurt.
4. Mar. 9. Very early in the morning, a passenger train on the Lake Erie and Western road ran over a cow near Lafayette, Ind., and the engine was upset down a bank, the baggage car following it. The fireman was fatally, the engineer less severely, scalded.

*April.*

1. April 18. In the morning, a car of a freight train on the Charlotte, Columbia and Augusta road caught fire near Charlotte, N. C., and was partly destroyed.
2. April 28. A freight car of a freight train on the New York Central and Hudson River road caught fire when near Cranesville, N. Y., and was destroyed.

*May.*

1. May 21. A butting collision between a Michigan Central and a Detroit, Lansing and Northern freight on the track used by both roads in Lansing, Michigan. Both engines and several cars were badly broken, and the wreck partly destroyed by fire.
2. May 17. In the morning, several cars of a freight train on the Northern Central road were thrown from the track near Parkton, Pa., by the breaking of an axle; several cars were wrecked, and the wreck caught fire, burning up five oil-tank cars.
3. May 19. Early in the morning, several cars of a freight train on the Lehigh Valley road were thrown from the track at East Pennsylvania Junction, Pa., by a broken axle. An oil car caught fire, and thirteen cars were destroyed.
4. May 7. Very early in the morning, a freight train on the Green Bay and Minnesota road broke through a bridge near Centralia, Wis., which had been partly burned by a slow fire, the ties and rails remaining in place while the stringers were nearly burned through. The engine passed nearly across and fell, and ten cars went after it and were piled up in a bad wreck. The engineer, fireman and a brakeman were hurt. The wreck caught fire and was destroyed.

*June*

1. June 30. In the night, six cars of a freight train on the Illinois Central road were thrown from the track near Peotone, Ill., by a broken wheel. The wreck caught fire and was burned.
2. June 9. In the morning, an express car on a passenger train on the Long Branch Division of the Central Railroad, of New Jersey, caught fire when near Little Silver, N. J., and was destroyed.
3. June 21. In the night, a car of a freight train on the Central Railroad, of New Jersey, caught fire near Bayonne, N. J., and was destroyed. It set fire to a road bridge over the track, which was also destroyed.

*July.*

1. July 25. A freight train on the Texas and Pacific road broke through a bridge at Baker Creek, Texas, which had been partly burned by a slow fire. Nine cars went down and were wrecked, and the wreck caught fire and was burned up.

*August.*

1. Aug. 27. Early in the morning, a freight train on the Chicago, Burlington and Quincy road broke through a bridge near Albia, Iowa, and the cars were piled up in a bad wreck below. The wreck caught fire and several cars were burned up. A brakeman was fatally hurt.



*September.*

1. Sept. Very early in the morning, a section of a circus train on the Chicago and Alton road ran into the rear of a preceding section, which was just backing out of a siding at Laundale, Ill. A sleeping car and a caboose were wrecked, and the caboose burned up.
2. Sept. 23. In the morning, an oil train on the New York, Lake Erie and Western road broke in two near Sloatsburg, N. Y., and the rear section ran into the forward one, wrecking several cars. The oil caught fire and a number of cars burned up, completely destroying the track for some distance. The road was blocked all day.
3. Sept. 25. Very early in the morning, a Chicago and Alton freight struck a Wabash, St. Louis and Pacific freight at the crossing of the two roads at Jacksonville Junction, Ill. The engine and several cars were wrecked; the wreck caught fire, and several cars were burned up, with the station building adjoining.
4. Sept. 9. In the morning, several cars of a freight train on the New York, Lake Erie and Western road were thrown from the track at Chemung Narrows, N. Y., by a broken axle. The wreck caught fire and three cars were destroyed.
5. Sept. 14. In the morning, the engine of a passenger train on the New Jersey Southern road burst a flue when near the dock at Sandy Hook, N. J. The engineer stood at his post, though badly scalded, and stopped the train, saving it from going off the dock.

*October.*

1. October 5. In the evening, a passenger train on the New York, Lake Erie and Western road ran into the rear of some cars which had been broken loose from a freight at Vandalia, N. Y. The engine and several cars were wrecked, and the wreck caught fire and was partly destroyed. The engineer was badly hurt.
2. Oct. 29. In the afternoon, a freight train on the Pennsylvania Railroad ran into a preceding train near Lancaster, Pa., wrecking several cars. An oil car caught fire, and seven cars were burned up.
3. October 1. Very early in the morning, there was a butting collision between two freight trains on the St. Paul, Minneapolis and Manitoba road near Melrose, Minn. Both engines and fifteen cars were piled up in a bad wreck, a fireman and a brakeman hurt. The wreck caught fire and was destroyed.
- October 5. About noon, several cars of an oil train on the New York, Lake Erie and Western road ran off the track near Port Jervis, N. Y., and one of the tank cars caught fire. Fifteen cars were destroyed, the fire being finally stopped by firing slugs from a cannon into several tanks, allowing the oil to run out. The track for some distance was completely destroyed.

5. Oct. 26. In the morning, the engine of a freight train on the Indiana, Bloomington and Western road exploded its boiler just as it was starting from Champaign, Ill., with a freight train. The force of the explosion was downwards, lifting the engine from the track and throwing it over. The fireman was fatally scalded and a brakeman hurt.
6. October 6. Very early in the morning, a dining car on a passenger train on the New York, Lake Erie and Western road caught fire when near Binghamton, N. Y., and was almost destroyed. The fire extended to the next car, a sleeping car, which was badly damaged.

*November.*

1. Nov. 28. In the evening, several cars of a coal train on the New York and New England road were thrown from the track at Burnside, Conn., by a misplaced switch. The caboose caught fire and was destroyed.
2. Nov. 25. In the morning the engine of a passenger train on the Cleveland, Tuscarawas Valley and Wheeling road ran off the track near Bridgeport, Ohio, and upset. The engineer was fatally scalded.
3. Nov. 28. In the night, four box cars and twelve oil-tank cars of a freight train on the Lehigh Valley road ran off the track in Weissport, Pa., and went down a bank. The wreck caught fire and was destroyed.

*December.*

1. Dec. 22. In the night, a freight train on the New York, Lake Erie and Western road ran into the rear of a preceding freight near Ramapo, N. Y., damaging several cars, and derailing several others. One track had been cleared, when a spark from an engine of a passing passenger train set fire to the oil from a wrecked tank car, and seven or eight oil cars were burned up, the burning oil making a great fire, and completely destroying the track for half a mile.
2. Dec. 30. Near midnight, on the 30th, a west bound freight train on the Pennsylvania Railroad ran into the rear of a preceding freight, which had just started up after stopping to repair a broken coupling near Christiana, Pa. The rear engine and several cars were wrecked and thrown over both tracks.  
A minute later an east bound freight came up and ran into the wrecked cars. The engine was upset and the wreck caught fire burning up two engines and thirteen cars. A brakeman was killed; an engineer and a fireman were fatally hurt.
3. Dec. 10. In the night, a car of a passenger train on the Wilmington and Weldon road caught fire from the stove when near Rocky Mt., N. C., and was destroyed.

## SUMMARY OF EXHIBIT "H."

Of the 1,453 train accidents for the year 1881, thirty-eight or 2.60 per cent. resulted in fire. Of these thirty-eight accidents, twenty-seven were on freight trains; nine were on passenger trains; and two were on passenger and freights together.

Of the fires on freight trains, five were on oil trains; one on a flat car loaded with cotton; and four originated in the caboose. The origin of the rest is not given.

Of the fires on passenger trains, one originated from a stove without being caused by any other train accident; one in a baggage car with no causing train accident; one in a dining car with no other accident to cause it; one in an express car under similar conditions; one in a wreck composed of an express, a baggage and a postal car. The place of origin of the fire in the remaining accidents was not obtainable.

Of the character of the accidents resulting in fire on freight trains:

Seven were rear collisions; three persons were killed, but not by fire.

Two were butting collisions; two persons were injured, but not by fire.

One was a crossing collision; no one hurt.

One was a broken wheel; no one hurt.

Three were broken axles; no one hurt.

One was a broken rail; one killed and four injured, but not by fire.

One was a misplaced switch; no one hurt.

Four were broken bridges; one killed and three injured; not by fire.

Three were derailments not included in the above, in which one was killed by fire, and one injured, not by fire.

Four were from other causes; no one hurt.

Of the character of accidents resulting in fire on passenger trains:

Three were broken rails; one killed by fire; one killed and thirty-four injured, but not by fire.

One was a broken wheel; five killed by fire; twelve injured otherwise.

Five were from other causes; eight injured, but not by fire.

The two accidents to passenger and freights together, were both rear collisions, in which two were killed and six injured, but not by fire.

The casualties to persons on the freight train accidents resulting in fire, given above, were:

Killed by fire.....	1;	Injured by fire.....	0
Killed otherwise .....	5;	Injured otherwise.....	10
	<hr/>		<hr/>
	6		10

The casualties to persons on the passenger train accidents resulting in fire were:

Killed by fire.....	6;	Injured by fire.....	0
Killed otherwise.....	1;	Injured otherwise.....	54
	<hr/>		<hr/>
	7		54

The casualties to persons in the two rear collisions between passenger and freight trains were :

Killed by fire.....	0;	Injured by fire.....	0
Killed otherwise.....	2;	Injured otherwise.....	6
	<hr/>		<hr/>
	2		6
Total killed by fire .....	7;	Injured by fire.....	0
Total killed otherwise .....	8;	Injured otherwise.....	70
	<hr/>		<hr/>
Total killed .....	15;	Total injured .....	70

Of these accidents resulting in fire, seven, or 46.67 per cent., were killed by fire, and eight, or 53.33 per cent., otherwise, and none were injured by fire.

Killed by fire in collisions.....	0
Killed otherwise in collisions.....	3
	<hr/>
Total killed in these collisions resulting in fire.....	3
Killed by fire in derailments .....	7
Killed otherwise in derailments .....	5
	<hr/>
Total killed in derailments resulting in fire.....	12
	<hr/>
Total killed .....	15

Besides the above mentioned casualties by fire, there were six accidents, in which twenty-two persons were scalded, four being killed.

Four of these accidents occurred on passenger trains, one being an explosion, one person injured ; two were derailments, two killed and one injured ; one a rear collision, fourteen injured.

The other two accidents were on freight trains, one being an explosion, one killed and one injured ; the other was a rear collision, one killed and one injured.

# PER MILE SHOWINGS.<sup>(d)</sup>

Year.	(c) Length entire line—Miles.	Capital stock.		Total debt.
		Authorized.	Paid up.	
		Amount.	Amount.	Amount.
1868.....	5,890.66	\$29,739 69	\$29,192 13	\$24,039 03
1869.....	5,992.27	30,030 74	29,385 83	31,187 82
1870.....	6,282.92	32,542 97	31,337 91	25,660 75
1871.....	6,536.50	37,617 56	32,186 51	27,163 27
1872.....	(b) 7,408.33	40,359 80	29,583 07	30,764 01
1873.....	7,336.92	44,015 56	33,678 97	32,458 90
1874.....	7,573.10	48,617 07	34,986 68	36,669 00
1875.....	7,983.17	42,056 81	33,634 20	37,775 97
1876.....	(c) 8,002.31	43,468 28	34,811 23	37,925 32
1877.....	(c) 8,292 21	45,380 06	34,188 67	37,146 72
1878.....	(c) 8,552.60	44,288 12	33,072 89	35,974 10
1879*.....	(c) 8,552.60	45,879 24	33,019 54	18,937 15
1880.. .....	(c) 10,922.47	37,523 60	31,281 19	32,809 10
1881.....	(c) 12,054.63	35,714 46	29,388 64	33,557 90
Average.....	.....	\$39,802 43	\$32,124 82	\$31,576 43

(a) This is the length of the single main track and branches.

(b) Includes roads in process of construction.

(c) In dividing the capital stock, 223.2 miles less than these totals were used, because the capital stock of the Ohio and Mississippi R<sup>y</sup> Co. extends over only 393 miles, whereas its debt, earnings, etc., extend over 616.2 miles.

\* Returns incomplete.

(d) These per mile showings are found by dividing the total single track reporting to this office into the total capital stock, debt, earnings, etc., reported.

## PER MILE SHOWINGS—Continued.

Year.	Stock and Debt.	Cost of road and Equipment.
	Amount.	Amount.
1868 .....	\$53,231 16	\$51,364 36
1869 .....	60,573 65	53,680 18
1870 .....	56,998 66	53,078 79
1871 .....	59,349 78	55,959 35
1872 .....	60,347 08	52,388 80
1873 .....	66,137 87	62,982 01
1874 .....	71,655 68	63,945 87
1875 .....	71,410 17	62,234 04
1876 .....	72,736 55	63,223 97
1877 .....	71,335 39	61,512 36
1878 .....	69,046 99	59,587 33
1879* .....	51,956 69	59,538 05
1880 .....	64,090 29	56,753 70
1881 .....	62,946 54	57,753 32
Average.....	\$63,701 25	\$58,143 01

\* Returns incomplete.

## PER MILE SHOWINGS—Continued.

Year.	Average number of trains passing over each mile of road.	Average number of cars passing over each mile of road.
1868.....		
1869.....		
1870.....		
1871.....	7,191	49,293
1872.....	7,166	51,100
1873.....	8,121	51,651
1874.....	7,851	88,932
1875.....	7,234	73,037
1876.....	7,292	88,815
1877.....	6,594	91,705
1878.....	6,503	94,342
1879.....	6,141	92,772
1880.....	6,340	98,747
1881.....	5,680	84,220



## PER MILE SHOWINGS—Continued.

Year.	Average number of passengers carried over each mile.	Average number of tons of freight carried over each mile of road.
1868.....		
1869.....	78,816	222,337.7
1870.....	88,365	266,262.7
1871.....	63,248	271,396.5
1872.....	74,175	394,595.3
1873.....	82,543	466,256.9
1874.....	82,118	490,898.4
1875.....	82,524	429,877.6
1876.....	81,624	474,787.6
1877.....	84,067	500,099.0
1878.....	69,103	501,178.4
1879.....	63,444	574,621.0
1880.....	70,302	609,345.9
1881.....	76,328	631,061.7

## PER MILE SHOWINGS—Continued.

Year.	Average amount received from passengers.	Average amount received from freight.
1868.....	\$2,523 04	\$4,923 25
1869.....	2,605 24	5,439 72
1870.....	2,674 35	5,307 75
1871.....	2,498 77	6,011 87
1872.....	2,173 69	6,194 27
1873.....	2,343 21	7,303 93
1874.....	2,274 14	6,563 82
1875.....	2,144 08	5,415 26
1876.....	2,060 26	5,303 98
1877.....	1,880 34	4,664 47
1878.....	1,711 34	4,819 40
1879 <sup>*</sup> .....	1,572 72	4,681 56
1880.....	1,668 52	5,454 29
1881.....	1,783 64	5,774 33

\* Returns incomplete.

## PER MILE SHOWINGS—Continued.

Year.	Average gross earnings.	Average operating expenses.
1868.....	\$7,998 89	\$5,588 52
1869.....	8,529 41	5,962 90
1870.....	8,419 00	5,892 22
1871.....	9,049 40	6,164 87
1872.....	8,844 65	6,078 93
1873.....	10,211 00	7,344 72
1874.....	9,365 81	6,751 53
1875.....	8,078 91	5,884 83
1876.....	7,905 36	5,671 07
1877.....	7,006 03	5,225 04
1878.....	7,002 51	4,715 99
1879*.....	6,714 67	4,472 45
1880.....	7,546 54	4,581 83
1881.....	7,981 50	5,086 27

\* Returns incomplete.

## ENTIRE LLNE.

*Per Mile Showings for 1880 and 1881 compared.*

	1880.	1881.	Percent. of increase or decrease.
Capital stock (paid up).....	\$30,662 39	\$29,388 64	— 4.15
Debt .....	32,809 10	33,557 90	+ 2.28
Gross earnings.....	7,546 63	7,981 50	+ 5.76
Net earnings.....	2,964 78	2,895 23	— 2.35
Passenger earnings .....	1,668 53	1,733 03	+ 3.86
Freight earnings.....	5,454 29	5,766 02	+ 5.72
Mail earnings.....	164 67	181 07	+ 9.96
Express earnings .....	117 52	143 96	+ 22.59
Earnings from other sources.....	141 63	157 39	+ 11.12
Operating expenses .....	4,581 83	5,086 27	+ 11.09
Maintenance of way and structures .....	1,037 23	1,166 27	+ 12.44
Maintenance of cars.....	463 01	502 35	+ 8.49
Motive power.....	885 58	1,043 16	+ 17.79
Conducting transportation .....	1,817 67	1,971 74	+ 8.47
General expenses .....	378 31	402 26	— 6.33

## PROPORTION FOR OHIO.

*Per Mile Showing for 1880 and 1881.*

	1880.	1881.	Percent. of increase or decrease.
Capital stock (paid up).....	\$31,021 11	\$31,861 08	+ 2.78
Debt .....	33,488 86	33,639 42	+ 0.45
Gross earnings.....	7,308 70	7,852 30	+ 7.44
Net earnings.....	2,792 79	2,871 41	+ 2.81
Operating expenses .....	4,368 10	5,021 30	+ 14.97

TEN YEARS OF OHIO RAILWAY MANAGEMENT.

	1871.	1881.	Increase or decrease, per cent.
<b>I. THE MILE SHOWING.</b>			
<i>a. Investment.</i>			
1. Capital stock (per mile).....	\$32,186 51	\$29,388 64	— 8.69
2. Debt (per mile).....	27,163 27	33,557 90	+ 23.54
3. Stock and debt (per mile).....	59,349 78	62,946 54	+ 6.06
4. Cost of road and equipment (per mile)...	55,959 35	57,753 32	+ 3.21
<i>b. Work done by each mile.</i>			
1. Trains carried.....	7,191	5,680	— 21.01
2. Cars carried.....	49,293	84,220	+ 70.85
3. Passengers carried.....	63,248	76,328	+ 20.64
4. Tons of freight carried.....	271,396.5	631,061.7	+ 132.52
<i>c. Earnings per mile.</i>			
1. Total.....	\$9,049 40	\$7,981 50	— 11.80
2. From passengers.....	2,498 77	1,733 02	— 30.64
3. From freight.....	6,011 87	5,766 02	— 4.08
4. Net.....	2,884 53	2,895 23	+ 0.37
<i>d. Operating expenses per mile.</i>			
1. Total.....	\$6,164 87	\$5,086 27	— 17.49
2. Maintenance of way.....	1,785 07	1,166 27	— 34.67
3. Maintenance of cars.....	585 32	502 35	— 14.17
4. Motive power.....	968 48	1,043 16	+ 7.72
5. Conducting transportation.....	2,310 08	1,971 74	— 14.64
6. General expenses.....	515 92	402 26	— 22.03
<b>II. THE CAR SHOWING.</b>			
<i>a. Work done by each car.</i>			
1. Miles run.....	9,785.27	11,890.64	+ 21.51
2. Miles run by passenger.....	36,089.32	45,595.43	+ 26.34
3. Miles run by freight.....	7,043.40	10,844.17	+ 53.96
4. Number of persons carried one mile by each passenger.....	4,730.21	6,851.14	+ 44.84
5. Number of tons of freight carried one mile by each freight car.....	58,793.73	94,225.67	+ 60.26
<i>b. Receipts per car.</i>			
1. For each mile run.....	\$0.183	\$0.095	— 48.09
2. For each mile run by passenger car.....	0.518	0.341	— 41.00
3. For each mile run by freight car.....	0.184	0.079	— 57.07
<i>c. Expenses per car.</i>			
1. For each mile run.....	\$0.125	\$0.060	— 52.00
2. For maintenance of car for each mile run	0.012	0.006	— 50.00
<b>III. THE LOCOMOTIVE SHOWING.</b>			
<i>a. Work done by each locomotive.</i>			
1. Miles run.....	27,376.40	23,482.79	— 14.22
2. Number of cars moved one mile.....	187,772.42	348,121.22	+ 85.39
3. Number of cars per train.....	6.8	14.8	+ 117.66
<i>b. Receipts per locomotive.</i>			
1. For each mile run.....	\$1.258	\$1.681	+ 33.62
<i>c. Expenses per locomotive.</i>			
1. For each mile run.....	\$0.857	\$0.896	+ 4.55
<b>MISCELLANEOUS ITEMS.</b>			
Average number of employes per mile.....	6	6	0.
“ passenger rate per mile (cents).....	3.957	2.336	— 40.96
“ freight rate per mile (cents).....	2.215	.915	— 58.69
Number of locomotives.....	1,717	2,916	+ 69.25
“ of passenger cars.....	874	1,343	+ 53.77
“ of express and baggage cars.....	474	612	+ 29.11
“ of freight cars.....	30,173	80,734	+ 167.57
“ of other cars.....	1,427	2,690	+ 88.51
Total number of cars.....	32,948	85,379	+ 159.74

In the above showings the following facts will be noted :

First, each mile of road operated by the companies reporting to this office has, with 6 per cent. increase of stock and debt and 3 per cent. additional cost, transported 71 per cent. more cars for 12 per cent. smaller gross earnings and 17 per cent. decrease of expenses; 21 per cent. more passengers for 29 per cent. smaller earnings; 133 per cent. more tons of freight for 4 per cent. smaller earnings; and has earned a slightly greater net amount.

Second, each car employed by the companies has run 22 per cent. more miles for 50 per cent. smaller cost of maintenance. The gross earnings have been 48 per cent. smaller per car for each mile run, while the operating expenses have been decreased 52 per cent. Each passenger car has run 26 per cent. further, carried 45 per cent. more passengers one mile, and received 41 per cent. smaller earnings. Each freight car has run 54 per cent. further, carried 60 per cent. more tons one mile, and received 57 per cent. smaller earnings for each mile run.

Third, each locomotive has run 14 per cent. fewer miles, but moved 85 per cent. more cars one mile, and 118 per cent. more at one time, for 34 per cent. more money per mile run, at 5 per cent. more cost.

Hence, there must have been a great increase in the efficiency of railway management.

#### TELEGRAPH COMPANIES.

Reports have been received from only twelve telegraph companies. They report:

Capital stock authorized .....	\$105,201,150 00
"    subscribed .....	187,150 00
"    paid in.....	187,150 00
Funded debt.....	6,244,102 00
Unfunded debt.....	53,200 00
Stockholders in Ohio.....	80
Amount of stock held by them.....	71,925 00
Length (all in Ohio) .....	430.98 miles
Stations in Ohio.....	43
Employes in Ohio.....	210
Cost of line and equipment.....	\$223,786 33
Earnings (gross).....	149,764 79
Operating expenses.....	117,476 39
Net earnings.....	31,704 12
Dividends paid.....	524 00
Interest on bonds paid.....	427,455 51
Other payments.....	467,775 23

## RAILROAD CONFEDERATIONS.

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It has been feared by the people of the entire country, as well as by those of Ohio, that railroad corporations, growing in power, rapidly extending their lines from the Atlantic ports to the remotest harvests of the West, forming consolidations of through lines, with far-reaching tributary branches, into combinations of most formidable proportions, might, by a concert of action be wrought into one vast system of management, and that this organization with a singleness of purpose, might, by terms of their own exclusive making, determine just how large a share of the product of the producer should be set aside to compensate the transporter.

This apprehension on the part of Ohio, has been expressed by the Secretary of "Toledo Produce Exchange," in his report for 1881, in the following terms :

"The drift of our times is toward consolidation and pooling, and consequent monopoly. Such measures are against the principles of our government, the public peace and the safety of the rights of our people. From the beginning our laws have been framed with a view to suppress all combinations, as dangerous and oppressive in their tendency. I am glad to be able to direct attention to a bill lately introduced into the Legislature of the State of New York, making consolidations, whether of earnings or stock, a violation of law, and it becomes our own State to awaken in time to the peril of the increase of power by the consolidation of chartered companies.

"The Board of Trade and Commerce of Chicago, in its report of 1880, expresses its views of the situation in the following terms: 'The great railway corporations of the country are rapidly absorbing the weaker ones as parts in their respective systems, or to destroy them as competitors. Reflecting men stand aghast as they observe link after link forged and firmly welded in the great chains which a very few individuals hold, and so effectually control as to be a standing menace to the commercial prosperity of the country, and its best and highest interests.'

"In the meantime efforts to resist undue encroachment are paralyzed, a faint protest or note of warning is now and again heard in the land. The views of some distinguished statesman, lawyer, merchant or railway magnate, are sought, given and published, discussed, perhaps, for a few days, and all is still.

"The work of broadening, deepening and strengthening a power more potent than government, however, moves quietly but steadily forward, while legislators,



State and National, are lulled into a dream that all is well, or are held by the throat with a mailed hand that threatens, with the ability to execute, political annihilation if the first move be taken to interfere in the progress of schemes for the absorption of the people's sustenance or in any manner embarrass those who 'having possessed themselves of the gateway of commerce' claim the right to enjoy all the advantages of the situation which their own ideas of right and justice may suggest that they are entitled to.

The Secretary of the Chamber of Commerce of New York, in the annual review of the interests of commerce, says: "This question, of vital importance to commerce, has continued to engross the thought of the chamber, and will not be relinquished until a practical solution is in some manner found. It would be monstrous, indeed, if the right-of-way and the privileges granted by the Legislature of the State for the benefit of its citizens, and the promotion of their trade, should be devoted by the corporations thus chartered, not only to the advantage of rival and strange interests, but to their own positive disadvantage. In a word, that a monopoly should be allowed to interfere with the public good. \* \* \* \* \*

Corporations will not long be permitted to override the rights of individuals or communities."

It will be seen by the quotations above made, that apprehension of evils to the general interests of the country, through the machinations of railway corporations, are wide-spread.

It is believed by many that the consolidation of the great routes of inland commerce would result in an organization that would put its hand upon the legislative and judicial powers of the State, give direction to their acts and decisions, until finally the people would find they were powerless to extricate themselves from the grasp of a monopoly only by an uprising in violent rebellion.

Uncommon powers of any particular class, few in numbers with uncommon means for the execution of its schemes of aggrandizement, is always alarming to the masses.

There is no question that there have suddenly grown into vast proportions many railroad organizations in the United States, managed by a few men possessed of colossal fortunes.

The important question then is: "Is it probable they will confederate into one management, with the powers and purposes of a monopoly?"

#### A RAILROAD CONFEDERATION OR FREIGHT POOL,

Is an agreement as to what shall be the relative transportation charges, or apportionment of freights, or of earnings between railroads engaged in competitive traffic.

There have been many pooling schemes at different times in the past, both in the West and East, among which may be mentioned the Southern Railway Association, between points on the Missouri river—Kansas City, Atchison, Leavenworth, St. Joseph, and the railroads from these points and the cities of St. Louis, Chicago and Toledo. The Chicago-Omaha pool, a combination of the three great railroads leading westward from Chicago—the Chicago and North-western Railway, the Chicago, Rock Island and Pacific Railroad, and the Chicago, Burlington and Quincy Railroad. The pooling arrangements of the Chicago and North-west railroads—the cattle pool, by which the cattle of the West were apportioned to the routes east of Chicago in allotments upon an agreed percentage. The pool in cattle traffic is now managed by the Joint Executive Committee of Railroad Managers. The coal-oil pool, controlled by the Standard Oil Company, has attracted a great deal of attention by its marvelous success and the exclusiveness of its monopoly. The Atlantic Coal Combination involved not only the railroads interested in its transportation, but the mining companies engaged in its production. And probably many other pools not enumerated. But the confederation of the most interest to the people generally, and the one to which the attention of the reader is more particularly directed, is that of the great trunk lines extending from the great seaboard cities westward—that of the New York Central and Hudson River Railroad Trunk Line, extending to Niagara and Buffalo; the New York, Lake Erie and Western, reaching to Buffalo and Salamanca; the Pennsylvania Company's Railway, terminating at Pittsburgh; the Baltimore and Ohio, extending to Wheeling and Parkersburg—all with western consolidated lines reaching to Chicago. There have been frequent attempts of these companies to confederate their interests since 1869—the date of the formation of through lines from Chicago to New York and Philadelphia.

In a railroad point of view, there are strong reasons why such an arrangement should be made and faithfully performed, among which the following are mentioned:

It will be an easy matter to determine the rates of through traffic, and to maintain them.

It will avoid a competitive warfare, and consequent loss.

It is found that there are economies that can be practiced in the handling of freight; in its more rapid transit: in the employment of cars, locomotives and train hands.

It will make more permanent reasonable rates, and thereby inform

the shipper and speculator with reasonable certainty what the transportation factor must be in their calculations.

It will enable railroad managers to avoid the strongly marked discriminations that he now assumes he must make in view of self-preservation—that is, discriminations between localities and trade centres—low through or competitive rates, and high local or non-competitive rates.

It will serve railroad managers in the correcting of the effects of that anomalous feature in its commerce, wherein the laws of supply and demand and competition do not serve to regulate freight charges, as in other highways of commerce.

On the other hand, it is feared that confederation will do more than what is claimed by its advocates.

It is believed that a successful organization of the great trunk lines into a unified management will serve to relieve them from the ordinary vicissitudes that usually accompany business ventures.

It is asked: "Why should there be this immunity?"

It is believed that such an organization will enable them to maintain their usual profits, even in seasons of adversity to the producer. It is asked: "Why this unusual guaranty?"

It is believed that such an organization will put these vast corporations into the possession of such elements of power that they can crush growing rivalries, and thereby maintain their ascendancy and become a monopoly in the transportation of the rapidly increasing products of the country.

It is not known that these trunk lines have ever proposed a consolidation.

Such a proposition would mean the abdication of several great managers and the exaltation of some one.

Such a proposition, it is believed, would only arise from fear of the overthrow of its corporation; no one proposes to abdicate a flattering power when secure. Such a proposition is hardly possible—the unifying of four nearly equal powers.

The rapid expansion of these trunk lines into connections westward and laterally has rendered, each successive year, the possibility less and less of a joint ownership in consolidation. These roads with extensions are very unwieldy of themselves; and it seems to be in the schemes of the manipulators of railways not to consolidate, but rather to pool or confederate; and the experiment has been, for the twelve or thirteen years, altogether upon the latter methods of management.

Such an almost infinite variety of interest attaches to these ways of

transportation—so unexpectedly are new interests springing up and asserting the necessity of a consideration of their part in the great problem; and so mazy and intricate the problem becomes that the best minds of the land are dazed in view of its intricacies when they have attempted to solve the question of a proper and equitable adjustment of rates between these great routes for the competing points in the Great West and the rival cities upon the Atlantic sea-board.

A brief view of the attempts made during the years of through lines from Chicago to the East will serve to show the probable or improbable establishment of that monopoly so much feared.

In 1869 there was an agreement entered into by which eastward grain was to be shipped to Baltimore at 10 cents per hundred pounds less than to New York.

In 1870 this difference was reduced to 5 cents.

In 1876 the basis of difference was changed, and it was agreed by the trunk-lines and western roads that the adjustment should be upon the relative differences of distance in the routes from Chicago to New York, Philadelphia and Baltimore; to Philadelphia, 10 per cent.; to Baltimore, 13 per cent. less than to New York; from Cincinnati to Baltimore, 24 per cent. less, and to Philadelphia, 12 per cent. less than to New York.

In less than two months after the adjustment of 1876, the New York Central and Erie Railways withdrew from the confederacy, claiming it gave too great advantage to Philadelphia and Baltimore. A war of rates followed, continuing from May until 1877.

In 1877, April 5th, another agreement took effect, re-establishing differential rates based upon relative distance from common shipping points, and in view of ocean rates to foreign ports, to which our inland freights were directed. This agreement was substantially respected until June 30, 1880, a term of about 3 years, at which time the New York Central withdrew, claiming that ocean rates from the rival seaboard cities had changed, giving Philadelphia and Baltimore greatly the advantage over New York on export freights.

The agreement was that all freights from the West to Baltimore should be 3 cents less per 100 pounds, and to Philadelphia, 2 cents less than to New York; on east-bound freight, first and second class, 8 cents less; and on third and fourth class, 3 cents less from Baltimore than from New York; the same classes, 6 and 2 cents less, respectively, from Philadelphia than from New York.

Upon the abandonment of this contract a war of rates followed, and it is estimated by Mr. Fink that it has cost the railroad companies east

of the Mississippi river, represented in the Joint Executive Committee at the rate of from twenty-five to thirty million dollars per annum.

In view of the many difficulties that have beset this question, as to what is a proper and equitable adjustment of rates between these great routes, Mr. Fink says:

"No one has, or can have any definite idea as to what constitutes an equitable distribution of the competitive traffic between the rival railroads and the rival cities;" and he further says, "If any definite idea could be found as to what constitutes a just and equitable distribution of traffic, it would be impracticable and impossible to predetermine the relative transportation charges that would result in the desired distribution."

As a further example of the difficulties that surround the question, the following is quoted from the report of the Board of Railroad Commissioners of Massachusetts for 1881:

"The New York 'anti-monopolists' have heretofore dwelt upon the injustice to their city resulting from the fact that Boston business was favored by a tariff from the West equal to theirs; and they have furnished testimony to show that Boston business was built up at the expense of New York by a failure to tax its freight as it should have been taxed. It is true that they also complain that Philadelphia and Baltimore are allowed part of the advantage of their comparative nearness to the West."

#### OTHER ELEMENTS OF INTERFERENCE.

It seems that the varying conditions of "terminal facilities" is an element in the problem. During the term of the last pooling agreement the Baltimore Chamber of Commerce found occasion to express itself thus:

"Do we, in point of fact, derive our proper advantages from our position on the short line where the land and water transportation meet,—is not the 3 cents per 100 pounds difference in the freight on grain in our favor more than neutralized by the practically free delivery to all parts of the port of New York, customary in that city?"

Thus it is found that after elaborate measures have been entered upon by those engaged in transportation, and charged with pooling adjustments, the enterprising and rivaling spirit of a city will at once seek by some new measure to relieve herself from the equality that has been attempted between it and other cities. Baltimore complained that New York had cheapened her method of delivering grain in her ports, and that the equitable differences fixed by the pooling commis-

sion between them had been eliminated by the enterprise of the grain dealers of her rival.

Limited storage facilities at any point must exert a modifying influence upon the traffic that seeks an outlet for foreign markets.

The Board of Trade and Commerce of Baltimore of 1881 says :

"What we need in Baltimore, most of all, is first, to develop this through business, even if Baltimore thereby becomes only a station on the grand line; and secondly, to make our city one of the great warehouses of the sea-board. We are as yet only on the threshold of the prosperity, which this city is capable of enjoying, if her business men make a proper use of our many advantages. But there must be in the future no question of adequate storage accommodation; no matter how great the accumulation of grain and other merchandise, our railroads must be taught to remember that they have invited these precious freights; that their welfare and our welfare demands that the western producer and the eastern shipper or grain speculator, or whatever we may style the owner of this grain, should find in Baltimore the amplest opportunity of holding and storing all or any goods that he may choose to bring here."

By means of the terminal facilities made at Baltimore by the Northern Central Railway Company it secured the wonderful expansion in its grain trade from five (5) millions in 1876 to twenty-two (22) millions in 1880.

This is a varying factor, and its varying influence may be exerted at any time in the near future in modification of any adjustment made upon the freight history of the past and the terminal facilities of the present.

#### RIVAL ROUTES.

The four great routes from the West to the Atlantic must now address themselves to the task of gathering into their confederation the two new routes—the New York, Chicago and St. Louis Railway and the Chesapeake and Ohio, Lexington and Memphis Railway—each of which hold important relations to Ohio. Not only this, but other railways are being built in Ohio that provide for two more through lines to the sea-board.

These new combinations add new uncertainties to the great problem of confederation, and render more improbable any permanency of any adjustments that may be arranged by any organization.

The situation of Ohio is greatly fortunate in its relation to the markets of our own country and those of the old world.

It is traversed by six through lines, from east to west, with many

roads and canals crossing these routes from river to lake, with three great railroad centres upon water-ways that lead to the Atlantic—Toledo, Cleveland and Cincinnati. All parts of Ohio can readily reach one or the other of these ports. This situation is an eternal bar to any transportation monopoly over the products of Ohio industry.

The water-way route from Toledo via Montreal and the St. Lawrence to Liverpool is 365 miles shorter than it is through New York to Liverpool. There is also a water-way by the Erie canal to New York. Over these water-ways, during the year 1881, Toledo shipped 33,215,517 bushels of grain, while but 20,842,493 bushels were shipped by rail. In 1870 the grain receipts at this market were 23,714,510 bushels, but in 1880 had increased to 57,078,602 bushels.

The Toledo Board of Trade says:

"The water-route for sound grain in good order becomes more and more attractive; and were it not for a charge of one cent per bushel at Buffalo for simply transferring the grain from the vessel to a canal boat, which is more than one-third the average lake freight hence to Buffalo, the lake movement would have been larger."

The market has become much more important by reason of the improvement of the canal way to the St. Lawrence.

The Montreal Board of Trade, in its report for the years 1878 and 1879, says:

"This, the finest canal system in the world, will, by and by, practically extend ocean navigation to the head of Lake Superior, and the result will be a great cheapening of rates of freight from the interior to Montreal, and a great increase in the quantity of produce and merchandise to be transported."

This canal way will now admit vessels of 1,500 tons burthen, and every foot of land in Ohio can now find a shorter route from Toledo through the St. Lawrence to Liverpool, with freight steamers to transport her grain, than it can now find over any of the great trunk-lines via New York, Philadelphia or Baltimore to Liverpool. The shortest route from San Francisco via Chicago to Liverpool, is via Montreal, 400 miles less than by way of New York upon routes as now traveled. In 1879 the exports of grain at Montreal was 21,630,108 bushels—20 per cent. greater than that of Boston. Montreal proposes to make its port a free one, and then with its magnificent water connections—its city a point toward which are converging great railway lines connecting the East with the West, and stretching out into the North-west to become a great central depot for the Northern States and British Territories.



The Northern Pacific Railway, leading eastward to Lake Superior from the great wheat regions of the extreme North-west; and Milwaukee, with a wonderful western system of railroads centering there, and with her annual export of thirty-one millions of grain, are both now tributary to this great route.

It will be seen that this short route across the continent, from San Francisco, via Chicago, Toledo and Detroit, to Liverpool, is a standing menace to the confederacy of trunk lines that are now manipulating the rates from Chicago to the rival cities on the Atlantic coast.

Any extravagance in the charges they may impose on traffic destined for the trans-Atlantic markets will at once divert it to the Montreal route. Relative distances favor that route to-day; relative rates favor the shipper on the trunk line routes to-day, and this alone secures them much of the grain they now transport.

Further security to the producing interests of Ohio is afforded by the situation upon the south. Two-fifths of the boundaries of Ohio are made by the Ohio river. Every foot of the railroad mileage, either directly or indirectly, connects with this river. This affords a water-way to the sea that is of immense value to the shippers of Ohio, simply from the modifying force it is capable of exerting upon through rates from the West and the East.

#### THE CHESAPEAKE AND OHIO RAILROAD,

Now outside the confederacy of trunk lines, forms a connection with the Ohio river at Huntington, and with Newport News, situated upon the finest harbor upon the Atlantic coast. It takes its place among the great trunk lines connecting the interior with the sea-board. It is laid entirely with steel rail, and is well equipped with locomotives and cars. The distance between these two points is 496.70 miles. This line, with probable extension, will make a through line 150 miles the shortest from Chicago to the sea. This port is 150 miles nearer ocean navigation than Baltimore, 85 miles nearer than Philadelphia, and 15 miles nearer than New York. This roadstead and harbor are perfectly sheltered, and safe for all classes of vessels in all conditions of weather; and at all tides there is deep water; all the docks have a depth of water from 24 to 32 feet, thus enabling the largest vessels to land with impunity. Between this port and the sea there have never been any obstructions from ice, but an open course by day and night without aid of pilot or tow-boat. Terminal facilities, in additional wharves, bonded warehouses and first-class elevators are being built. Very great advan-

tages are enjoyed at this port over any other on the Atlantic coast shipping points, both in accessibility and in the fact that the expense to vessels discharging and receiving their cargoes, and the charges upon products in transfer between cars and vessels will be reduced to the minimum, and much below those of any other points of transfer.

The shipments by this route from St. Louis were 996,210 bushels of corn, and 105,187 bushels of wheat, during the year 1880.

It proposes a route to the sea for the southern parts of Ohio, Indiana, Illinois, and the West; but to sustain it, rates must be governed by those from St. Louis to New Orleans, now proposing to become the seaboard market of the western world for grain.

#### THE MISSISSIPPI RIVER.

The most potent influence in the conservation of fair rates in the transportation of the productions of the great interior of the United States is to be found in the Mississippi river and its great tributary lines of water communication.

These rivers furnish natural competition with all the leading railroads of the United States. They form a confederacy of natural forces that declare to the convention of railroad presidents, when concerting rates for the great trunk line through routes: "Thus far canst thou go, but no further."

Within the last three years the transportation of grain upon the Mississippi toward the sea has quickened into wonderful proportions. Transportation facilities are now shaping themselves in the view that this river will soon be the great route of grain to Europe. The report of the Merchants' Exchange of St. Louis says of this trade:

"The movement of grain southward for export, via New Orleans, shows a most remarkable increase, and still it is yet in its infancy. It often takes many years to deflect the channel of trade, but when the practicability and cheapness of a route is once established, the growth is rapid. In 1870 the shipments of bulk grain to New Orleans for Europe comprised 66,000 bushels of wheat. In 1880 the shipments by barges to New Orleans for European account reached 15,762,664 bushels of corn, wheat and rye; and this would have been largely increased but for the early closing of the river by ice. The demand has been much greater than the tonnage, although the different lines have added to their capacity as fast as barges could be built."

The barge capacity for the transportation of grain upon this route, is now about 5,000,000 bushels per month.

New Orleans is preparing facilities for the new feature in her shipping interests, and as a grain exporting port is now attracting great

attention. Shipments of wheat from California have set in over the Tucson railroad for Europe via New Orleans. The movements for three years past indicate the probable utilization of the Mississippi and its tributaries for the cheapest movement of the grain of this vast and productive valley to the markets of Europe.

For years it was thought that the damp and warm air of the route to New Orleans and thence to Europe would prove injurious to the grain; yet the grain goes forward, millions of bushels annually. Seven millions of the grain shipped in 1880 were received in France, and no complaint as to its condition has been made.

This important diversion of grain southward has established the same price for grain in St. Louis that it has in the Lake ports. The great centering of railroads there as well as that of water-ways, make this market, with its outlet to the sea, of vast importance to the producing interests of the West.

The Ohio river affords a cheap way to New Orleans for the grain growers of Ohio. In this really cheap outlet to the markets of the old world, this State has another security against exorbitant charges from any monopoly that may possibly govern the rates through it to the East.

In view of the vast importance of the conservative influence of the great water-ways of the West upon rates of transportation eastward, for the products of the extensive interior, the Commissioners of Massachusetts, in their report for 1881, say:

"The best influence which Congress can exert toward lowering the rates of freight, is in legislation improving the navigation of the Mississippi and other great lines of water communication. These furnish natural competition with railroads, and impose a desirable check on railroad rates. If any section finds its share of traffic diminished by such action, it can bear such reduction, sustained by the idea that what honestly benefits one section is a benefit to the whole; while every one can see that the development of a cheap transportation route furnished by nature is very different from an arbitrary rule favoring one locality to the disadvantage of another."

It seems safe to conclude that the uncontrollable forces of commerce, the rivalry of cities, the rivalry of railroads, the natural competitions afforded by the important water-ways of the Nation, all naturally ally themselves against the permanency of any monopoly that may be attempted, and that there are no men in the land who will more readily discover these forces and direct their management in harmony therewith

rather than unwitting defiance thereof, than the railway managers themselves.

In the past, when there has been a constantly increasing demand for the means of transportation, there has been a constant decadence in the rates realized for the service; all the great forces that enter into the problem, except the selfish greed of the transporter, seem to conspire to sustain the same rule for the future.\*

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### CURATIVE LEGISLATION.

In the opinion of Chief Justice Okey in the Supreme Court, rendered in the case of *The State of Ohio on the relation of Geo. K. Nash, Att'y-General, against Wm. H. Vanderbilt, C. Vanderbilt, Augustus Schell, et al.*, was the following decision as to a defect in the organization of the Ohio Railway Company:

"A fatal defect in the organization of this company is found in the fact, that under Revised Statutes, § 3381, the directors of the consolidating companies must set forth in their joint agreement the places of residence of the new directors, as well as their number. This provision of the statute has not been complied with. There is no designation of any such place of residence. We are not to speculate as to the propriety of this provision, nor as to the manner it became incorporated into the statutes in its present form. It is sufficient to say the provision is in no sense directory, and that a compliance with it is indispensable."

Many of the railroad companies of the State, upon examination of the history of their organizations, became satisfied that the same defect characterized their consolidation agreements.

Upon application, the General Assembly of the winter of 1881-2 passed "*an act to cure defects in consolidation agreements*", as follows:

"SECTION 1. *Be it enacted by the General Assembly of the State of Ohio, That in all cases when the agreement for the consolidation of railroad companies heretofore filed in the office of the Secretary of State, is defective, by reason of the omission of a statement either of the number of the directors or other officers, or their places of residence, or the number of shares of capital stock, as required in such agreement by the laws of the State, such defect may be cured by filing, in the office of the Secretary of State, a certificate signed by the President and the Secretary of the consolidated company named in such agreement under its corporate seal, setting forth such omitted statements, which shall thereupon be countersigned a part of the agreement of consolidation, the same as if originally incorporated therein, and said agreement and all rights, remedies, powers, duties, and acts thereunder be construed accordingly, and the said agreement and certificate, and copies thereof,*

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\* Reference is made to the grain market tables in later portion of this volume, prepared to accompany this article.

duly certified by the Secretary of State, shall be held and received in all courts and other places as constituting the agreement of the consolidation of such companies to all intents and purposes, as if no such omission or defect had ever existed in such agreement; provided, that nothing in this act shall impair the rights of any person or corporation acquired prior to the passage of this act.

"SEC. 2. This act shall take effect from and after its passage.

"Passed April 17, 1882."

## DECISION OF SUPREME COURT OF OHIO

IN THE CASE OF

### THE STATE VS. VANDERBILT ET AL., REPRESENTING THE OHIO RAILWAY COMPANY.

1. Two railroad companies owning lines of railroad connected only by other railroads which such companies hold by lease, are not authorized to become consolidated into one corporation under Rev. Stats., § 3379.

2. The lines of two railroad companies, which are in their general features parallel and competing, cannot be connected for the carriage of freight and passengers over both "continuously," within the meaning of Rev. Stat., § 3379, and hence such companies cannot become consolidated into one corporation under that section.

3. A certificate made by the directors of consolidating railroad companies under Rev. Stats., § 3381, which fails to show any place of residence of the directors of the new company, is fatally defective.

The Cleveland, Columbus, Cincinnati and Indianapolis Railway Company and the Cincinnati, Hamilton and Dayton Railroad Company became consolidated into one corporation, it is claimed, in 1881, under the name of the Ohio Railway Company, by authority conferred in Revised Statutes, § 3379. Each company held by lease the roads of other railroad companies; the lines of the consolidating companies were connected only by such leased roads; and, previous to the alleged consolidation, the consolidating companies, with the lines which they held by lease, constituted two lines which were parallel and competing, to the extent indicated in the opinion of the court, for the carriage of freight and passengers from the city of Cincinnati to Lake Erie.

This is an action in quo warranto to oust the defendants from their franchise to be such new corporation. A number of questions were discussed by counsel and considered by the court, but the decision is confined to a determination of the following questions:

1. Whether two railroad companies owning lines of railroad connected only by other railroads, which such companies hold by lease, are authorized to become consolidated into one corporation under Rev. Stats., § 3379, which only permits companies to consolidate where their "lines of road" are so connected that cars may pass from the line of one company to the line of the other "without break or interruption."

2. Whether the lines of the two railroad companies named are, in their general features, parallel and competing, and if so whether they can be consolidated under that section, which authorizes consolidation only for the carriage of freight and passengers "continuously."

3. Whether a certificate made by the directors of consolidating companies under Rev. Stats., § 3381, which fails to show any place of residence of the directors of the new company, is fatally defective.

*George K. Nash, Attorney-General, B. H. Bristow, A. F. Perry, E. A. Ferguson, Converse, Booth & Keating, and R. C. Parsons, for the State.*

*R. P. Ranney, Harrison, Olds & Marsh, S. Burke, W. B. Sanders, and O'Conner, Glidden & Burgoyne, for the defendants.*

Okey, C. J. George K. Nash, Attorney-General, on October 25, 1881, filed in this Court a petition in quo warranto. The action is against William H. Vanderbilt and other persons named, and it is alleged in the petition that those persons, with others too numerous to be brought before the Court, have usurped the franchise to be a body corporate, under the name of the Ohio Railway Company, and that they wrongfully claim to possess certain corporate franchises, powers, and privileges. The prayer is for judgment ousting the defendants from exercising such franchises, powers, and privileges. The record consists of the petition, answer, reply, and an agreed statement of facts.

The burden is on the defendants to show by what authority they claim to exercise such powers, and the order of trial is the same as if the cause was for hearing on testimony. Consequently, we have held that under the statute (Rev. Stats., §§ 5190, 6760, 6772), the defendants were entitled to open and close in the argument.

The defendants claim to be such corporation, clothed with such powers and privileges, under authority of certain proceedings had in the months of July and September, 1881, whereby the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company and the Cincinnati, Hamilton and Dayton Railroad Company, Ohio corporations, were consolidated into one corporation, under the corporate name of the Ohio Railway Company.

The Cleveland, Columbus, Cincinnati and Indianapolis Railway Company is a corporation, with a line of railroad extending in a south-west direction from Cleveland, in Cuyahoga county, to Springfield, in Clarke county, a distance of one hundred and sixty-three miles; and the Cincinnati, Hamilton and Dayton Railroad Company is a corporation, with a line of railroad extending from Cincinnati, in Hamilton county, via Hamilton, in Butler county, to Dayton, in Montgomery county, Dayton being in a direction east of north from Cincinnati, and distant therefrom sixty miles. The authority to make the alleged consolidation is based by the defendants on section 3379 of the Revised Statutes, which is as follows: "When the lines of road of any railroad companies in this State, or any portion of such lines, have been or are being so constructed as to admit the passage of burthen or passenger cars over any two or more of such roads continuously, without break or interruption, such companies may consolidate themselves into a single company."

As the southern terminus of the first named road is twenty-four miles from the northern terminus of the latter road, being the distance between Springfield and Dayton, it is not claimed by the defendants that the consolidation could be effected under authority of that section, if the power to consolidate can only be exercised where burthen and passenger cars can pass from the road of one company to the road of the other, "continuously, without break or interruption." It is said, however, that it is not essential to a valid consolidation that such companies' own lines should be thus connected, but that where the consolidating companies, or either of them,



holds from another railroad company a perpetual lease of its road, and such leased line is so constructed that cars may thus pass from the line of the lessee to the leased line, and from the leased line to the line of the other consolidating company, the latter company and such lessee may consolidate; in other words, that such leased line is embraced by the words of the section, "lines of road" of the consolidating companies.

As each of the consolidating companies is possessed of such leased lines, by means of which it is said such connection is made, the importance of this contention of the defendants is manifest, and hence it is proper to state more definitely the condition and situation of the several roads affected by this controversy.

The line of the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company, as already stated, extends from Cleveland to Springfield. This is by way of Galion, in Crawford county, and Delaware, in Delaware county. It also extends from the latter place to Columbus, in Franklin county; and another part of its line, extending from Galion to Indianapolis, Indiana, crosses the track of the Dayton and Michigan Railroad Company at Sidney, in Shelby county. This constitutes the line of road which it owns.

The Cincinnati and Springfield Railway Company is a corporation with a line of railroad extending from a point near Cincinnati to Dayton. It also has by lease from the Cincinnati, Sandusky and Cleveland Railroad Company, a line of railroad extending from Springfield to Dayton. These two lines do not directly connect at Dayton, but by arrangement between the Cincinnati and Springfield railway and other railroad companies, a connection is made between the two roads, by means of a road used in common by several railroad companies. In 1871 the Cincinnati and Springfield Railway Company (party of the first part), the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company (party of the second part), and the Lake Shore and Michigan Southern Railway Company (party of the third part), executed an instrument in writing, called by the defendants a conveyance of the fee, or at least a perpetual lease, to the party of the second part, and by the relator called a running arrangement between the parties, which instrument contains numerous stipulations with reference to the construction of the line between Cincinnati and Dayton, the division of the earnings, and other matters, and by force of which agreement the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company acquired the right to run its cars from the terminus of its road in Springfield to Cincinnati, via Dayton; and cars of that company pass regularly over the roads stated, without break or interruption, from Cleveland to Cincinnati, a distance of two hundred and forty-three miles.

Among the stipulations in that instrument it is proper to mention the following:

"Nothing herein contained shall operate to grant and demise, or be construed to include the franchises to be a corporation granted to the party of the first part by the State of Ohio, or any other right, privilege, or franchise which is, or may be necessary to preserve the corporate existence or organization of the party of the first part, and all the said franchises to be a corporation, and all the rights, privileges, and franchises last aforesaid are reserved and excepted from these presents. And said party of the first part further covenants and agrees, that upon the written request of said second party, its successors or assigns, it will appropriate, under the laws of the State of Ohio, such real estate, rights, and interests as shall be required

for the maintenance and operating of said railway; and the costs and damages thereof shall be paid by the party of the first part.

"At the end of ten years from the delivery of possession of said Cincinnati and Springfield Railway Company's railway to the said party of the second part, the railway and appurtenances of the said party of the second part shall be consolidated with the railway and appurtenances of the said party of the first part, in case the laws of Ohio shall then permit and authorize such consolidation to be made, and said consolidation shall be made upon the basis of the proportionate values of the respective railways and appurtenances of said first and second parties, as the same shall appear by the net earnings of each for the three years next preceding the time of such consolidation.

"The intent and purpose of this indenture is to form and construct a shorter and continuous railway between Buffalo, New York, and Cincinnati, Ohio, of uniform gauge, for the transportation of persons and property between the last named cities and places beyond each, and to promote the interests of the public and the parties hereto."

The lessor companies have at all times maintained their organizations.

In 1863, the Dayton and Michigan Railroad Company (party of the first part), owning a line of railroad from Dayton to Toledo, in Lucas county, via Sidney, a distance of one hundred and forty miles, executed to the Cincinnati, Hamilton and Dayton Railroad Company (party of the second part), a perpetual lease of its road, which lease was modified by agreement, under the seals of the parties, in 1870. This instrument, so modified, contained numerous covenants, among others an agreement by the party of the second part to pay to the stockholders of the party of the first part certain dividends, and by the instrument the continued existence and organization of the Dayton and Michigan Railroad Company is contemplated. The lease contains this clause:

"In case said party of the second part, its successors or assigns, shall at any time hereafter fail to pay said dividends to the stockholders of said party of the first part, as hereinbefore provided for, or shall fail to keep and perform any of the other covenants and agreements in said lease (as hereby modified) contained, on its part to be kept and performed, and shall continue in such default for the period of ninety days, then, and in every such case, it shall be lawful for the party of the first part, its successors and assigns, at its or their option, without demand, to enter into and upon said demised premises and remove all persons therefrom; and from thenceforth the said demised premises and all additions and improvements which shall or may have been made to the same, shall be held by the party of the first part, as of its first and former estate; and upon such entry for non-payment of rent, or breach or non-performance of any agreement or covenant, all estate of said party of the second part in said demised premises, and the additions thereto, shall cease and determine, and the party of the second part hereby covenants and agrees upon the determination of said lease for the causes aforesaid, to surrender and deliver up to the party of the first part, its successors or assigns, the said demised premises, including rolling stock, equipment, machinery, and tools, equal to that now on said premises, in as good order and condition as the same may be at this time in, together with all additions and improvements that may be made thereto."

The agreed statement of facts contains the following: "Said Dayton and Michigan Railroad Company has, ever since said indenture as before it, maintained and kept up its organization as a corporate body by regular elections of directors and officers, keeping a business office, and in all things conforming to the provisions of its charter and the laws of the State as a railroad company."

Burden and passenger trains pass regularly over these roads (the Cincinnati, Hamilton and Dayton Railroad and the Dayton and Michigan Railroad), without break or interruption, from Cincinnati to Toledo, a distance of two hundred miles.

The Cincinnati, Hamilton and Dayton Railroad Company also controls and operates the following lines of railroads under leases—that is, the Cincinnati, Richmond and Chicago Railway, extending from Hamilton to Richmond, Indiana, and the Cincinnati, Hamilton and Indianapolis Railway, extending from Hamilton to Indianapolis.

At Dayton cars may pass from the lines so under the control and management of the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company to the lines so under the control and management of the Cincinnati, Hamilton and Dayton Railroad Company, and *vice versa*. The hiatus at that place between the northern terminus of the Cincinnati and Springfield Railway and the southern terminus of the Cincinnati, Sandusky and Cleveland Railroad, supplied by arrangement with and used in common by all the railroads at that place, as already stated, consists of two tracks, and all cars going in one direction pass over one of the tracks, and all cars going in the other direction pass over the other track.

At Sidney the track of the Dayton and Michigan Railroad, so operated by the Cincinnati, Hamilton and Dayton Railroad Company, crosses the line of the Cleveland, Columbus, Cincinnati and Indianapolis Railway, leading from Galion to Indianapolis, eighteen feet above the track of the latter road, and the two roads are connected at that place by a side track six hundred feet in length, by using which cars may pass from one road to the other.

1. If we regard the instrument by which the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company acquired the right to operate and control the Cincinnati, Sandusky and Springfield Railroad between Springfield and Dayton, and the Cincinnati and Springfield Railroad, between Cincinnati and Dayton, as a permanent lease, we state the case as favorably for the defendants as the law and the fact will warrant; and the same thing is true with respect to the instrument under which the Cincinnati, Hamilton and Dayton Railroad Company operates and controls the Dayton and Michigan Railroad. We recur then to the question whether lines held by leases are within the terms of section 3379. In order to determine that question, it is proper to consider all the legislation upon the subject.

The Cleveland, Columbus, Cincinnati and Indianapolis Railway Company and the Cincinnati, Hamilton and Dayton Railroad Company were each subject to all the restrictions and conditions prescribed in the act of 1848, "regulating railroad companies" (2 Curwen, 1394), and the amendments thereto, and are subject to the restrictions and conditions of all general laws of the State relating to railroads and railroad companies. The act of 1848, provided by section two, as follows: "Said corporation shall be authorized to construct and maintain a railroad, with a single or double track, with such side tracks, turn-outs, offices, and depots as they may deem necessary, between the points named in the special act incorporating the same, com-

mencing at or within, and extending to or into any town, city, or village named as the place of beginning or terminus of such road, and construct branches from the main line to other towns or places within the limits of any county through which said road may pass."

Previous to 1851 special provision was made in the charters of certain railroad companies for consolidation with other specified companies, but there was no general law upon the subject. The act of 1851, "relating to railroad companies" (2 Curwen, 1056), provided as follows: "Whenever the lines of railroad of any railroad companies in this State, or any portion of such lines, have been or may be constructed so as to admit the passage of burden or passenger cars over any two or more of such roads continuously, without break or interruption, such companies are hereby authorized to consolidate themselves into a single corporation." This evidently is to be understood as referring to the *line* of each road, but the word is made plural in form, for the reason that the two companies are referred to in the same form. And it was required, furthermore, by that act, that the agreement between the directors of the consolidating companies should specify, among other things, "the manner of converting the shares of capital stock, in each of said two or more corporations, into shares in such new corporation (and) the manner of compensating stockholders, in each of said two or more corporations, who refuse to convert their stock into the stock of such new corporation. \* \* \* Provided, that all stockholders, in either of such corporations, who shall refuse to convert their stock into the stock of such new corporation, shall be paid at least par value for each of the shares so held by them, if they shall so require, previous to the consolidation being consummated." And it was further provided, in effect, that when such consolidation was effected, the consolidating companies should cease to exist, and "all and singular their rights and interests, in and to every species of property, real, personal, and mixed, and things in action, shall [should] be deemed to be transferred to and vested in such new corporation, without any other deed or transfer."

Apart from the provision relating to consolidation, and wholly independent of it, the same act provided that any railroad company organized in pursuance of law might lease any part or all of any railroad constructed by any other company, if the lines of such lessor and lessee were continuous or connected, "upon such terms as may [might] be agreed on between said companies respectively." This was the first general provision on the subject.

By force of such lease, the right to the use of the road passed from the lessor to the lessee, according to such terms and conditions with respect to the use as are proper in a lease; but nothing else passed. "The lessee is the assignee for a term or period of the lessor—his bailiff to hold possession for him." *Penn. R. Co. v. Sly*, 65 Pa. St. 205. The power to lease does not imply a power to consolidate, nor does the power to consolidate imply a power to lease, but these powers are distinct and independent. This was true under the earliest legislation on the subject, and it is true under the present legislation. While in case of consolidation, the rights of the lessee pass to the new company, nothing else passes; and the lessor retains, unimpaired, its corporate existence, powers and privileges, except as affected by the agreement for such use; and hence, among the powers so retained by the lessor, is the power of consolidation. Clearly, in our opinion, there can be no consolidation unless the companies whose lines form the connection are consolidated. But here it

is plain that the connection is formed and only exists by the lines of the lessors, and that as to the lessor companies there is no consolidation. Evidently this is in accordance with the view of the statute taken by the parties when the lease to the Cleveland, Columbus, Cincinnati and Indianapolis Railway was executed, as will appear from the extracts from that instrument already set forth. Moreover, the statute, which makes ample provision for the protection of stockholders of the consolidating companies, makes none for the protection of stockholders of the lessor companies. Plainly, as it seems to us, there is no consolidation of the lessor companies; and it is equally clear that the right to consolidate, based on the consolidating companies' ownership of the leased roads, is wholly untenable. True, under the former as under the present statute, the power to consolidate may, in general, have been in abeyance in the lessor company; but it was the lessor's voluntary act if its power in this respect was suspended; and it is equally true that upon termination of the lease for any cause, the power to consolidate would revive with all its force.

Suggestion is made that the danger of defeating the consolidation by non-payment of rent, or the like, and consequent forfeiture of the lease, is not greater than the danger arising from the foreclosure of a mortgage, which practically might have the same effect as such forfeiture. If we admit this to be true, it does not militate against the construction we have given to the statute. The real question is as to the meaning of the words of the statute, "lines of road." In *Horkrader v. Leiby*, 4 Ohio St. 602, 612, the Judge delivering the opinion said that "a mortgage is now treated in both courts (law and equity) as a mere security for the debt, and the mortgagee is permitted to use the legal title only for the purpose of making effectual such security." But the title of a lessee is very different, and the road so leased to it is not *its line of road*, in the sense of the statute, but the road of the lessor company. Indeed, if we are permitted to depart from the plain words of the statute, and determine that where the control of a railroad by another company is permanent in its character, such ownership is sufficient to satisfy the requirement, it is difficult to see why a company having no other than leased lines, or one having a permanent running arrangement with another, may not come within the provision. I am fully persuaded that nothing of the sort was contemplated by the legislature.

I have so far spoken in the main of the proper construction of the acts of 1848 and 1851. But, although certain changes have been introduced into the subsequent acts (3 Curwen, 1882, 1884; 3 Sayler, 1760, 1872; 4 Sayler 2950; Rev. Stats., §§ 3300, 3379), there is nothing in any of them leading to any other conclusion in this respect than the one stated. Indeed, it is a well settled principle that where a statute has undergone revision, it should be construed as before, unless the new act plainly requires a change in the construction. Application has been given to this principle in cases where the change was very marked. *Williams v. The State*, 35 Ohio St., 174. And it is also a well settled rule that, if being of the very essence of a law that it be uniform and unchangeable, whatever was the meaning of a statute when first enacted, should be its meaning through all future time. *Reed v. Evans*, 17 Ohio, 128, 134. This, of course, is to be taken with the qualification that such statute, though unchanged in its language, may be modified or controlled in



its operation by a subsequent statute. *Slater v. Cave*, 3 Ohio St., 80. But there is nothing in the present statutes requiring any different construction, in the particular under consideration, than should have been placed on the former acts.

In holding that lines held by lease are not within the provision as to consolidation found in section 3379, we give expression to that which seems to be the plain construction of our statute. This position, in my opinion, is impregnable. But if we regarded the question as doubtful, the results should be the same; for it is a principle perfectly well settled, that where a statute granting corporate power admits of two probable but conflicting constructions, that construction should be given to it which is least favorable to the existence of the power. In no case is this principle more distinctly asserted than in *Straus v. Eagle Ins. Co.*, 5 Ohio St., 59.

We are told that other consolidations, based on such leased lines, have been made, and that the Secretary of State has received and filed the certificates of such consolidations, and furnished copies thereof. No doubt the practical construction which a statute has received in the executive department of the government, may in some cases aid in its construction. *Work v. Corrington*, 34 Ohio St., 64, 75. But we are not advised that there has been such uniform usage in that particular as to afford aid in the interpretation of this statute, much less control its construction.

2 But there is another view of this case to which I assent, and that view leads to the same result. It is in respect to the situation of these roads, and the relation they bear to each other, without special reference to the title by which they are held; and this presents a question of mixed law and fact. It is admitted in the agreed statement, "that for many years last past, a very large commerce has existed between the portions of the United States lying southerly, south-easterly, and south-westerly of Cincinnati, on the one hand, and the regions conveniently reached by the commerce of Lake Erie, and of the great lakes connected therewith, on the other hand. That the course of this commerce has been such that goods, wares, and merchandise in large amounts have been brought to the city of Cincinnati by the transportation lines upon the Ohio River, and by the railroad lines converging at Cincinnati, and the same has been transported by the railroads running through the State of Ohio to points upon Lake Erie, and thence transported by the way of the lakes, and the railroads running from cities upon the lakes to the Atlantic seaboard and the North-western States. That owing to the great competition existing between the transportation lines upon Lake Erie, the rates of transportation of merchandise from either Cleveland, Sandusky, or Toledo to points upon the said great lakes, except Lake Erie, either easterly or westerly, from the said cities, have been generally the same to any one of such points, notwithstanding the difference as to distance in favor of either of the said cities; so that merchandise going from either of said cities through the said lakes and destined to any point, either upon the Atlantic sea-board or in the North-western States, or any intermediate point east of and including Buffalo, generally paid the same rates for transportation upon the lakes, whether they were shipped from either Cleveland, Sandusky, or Toledo. That previous to the 8th day of July, 1881, there was an active competition between the aforesaid Cleveland, Columbus, Cincinnati and

Indianapolis Railway Company and the aforesaid Cincinnati, Hamilton, and Dayton Railroad Company in respect to the said transportation business from Cincinnati to points upon Lake Erie, and great rivalry existed as to the obtaining and conducting of such transportation business. That the said railroad companies respectively connected the said city of Cincinnati with the ports of Cleveland and Toledo on Lake Erie."

The Cleveland, Columbus, Cincinnati and Indianapolis Railway and the Cincinnati, Hamilton and Dayton Railroad, with their leased lines, constitute two great arteries of trade, both commencing on the Ohio River at Cincinnati, meeting at Dayton, and extending thence to Lake Erie, one terminating at Cleveland and the other at Toledo. The Attorney-General says, and the record supports the statement, that these roads are "for sixty miles lying parallel and near to each other." That they are, indeed, in the largest sense, parallel and competing roads, seems to be beyond dispute, and it may be fairly inferred from the record that a leading object in making the consolidation was to destroy that competition. That being true, the lines of these roads are not, in my judgment, "so constructed as to admit the passage of burthen or passenger cars over two or more of such roads *continuously*," within the proper meaning of section 3379. That the mere physical ability to pass cars from one road to the other satisfies the statute, is a construction of it which is wholly inadmissible, for the provision requiring such connection would be without meaning. In imposing that restriction upon consolidation, the legislature intended, not merely that the physical fact should exist, but that such consolidation should only be made for the very purpose of passing freight and passengers over both lines, or some material parts thereof not necessarily in a direct or straight line, but *continuously*.

Counsel for the defendants insist that in construing statutes, regard must be had to the words. No doubt that is true; but it does not follow that regard is to be had to nothing else. Mr. Bishop says that courts "do not close their eyes to what they know of the history of the country and of the law, of the condition of the law at a particular time, of the public necessities felt, and other like things." Bishop's Stat. Cr. § 77. In *Logan v. Courtown*, 13 Beav. 22, 29, it was said that in construing a statute, regard must be had to "the words in which it is expressed, applied to the facts existing at the time." In *Brewer v. Blougher*, 14 Peters, 178, 198, Taney, C. J., said: "It is undoubtedly the duty of the court to ascertain the meaning of the legislature from the words used in the statute, and the subject-matter to which it relates; and to restrain its operation within narrower limits than its words import, if the court are satisfied that the literal meaning of its language would extend to cases which the legislature never designed to embrace in it." And see Cooley's Con. L. (4th ed.) 79; Maxwell on Stats. 16-25.

Having regard to the language of this statute, in the light of such aids as are here indicated, I am satisfied the legislature never intended that railroads situated as these are should be regarded as constructed for the carriage of freight and passengers *continuously*, in the manner contemplated by the section. Indeed, each of these consolidating companies had a line for the carriage of freight and passengers from Cincinnati to Lake Erie, "continuously, without break or interruption," and the



policy of the country in general, indicated in constitutional and statutory provisions, has long been opposed to the consolidation of roads bearing such relation to each other, and this strengthens the belief that these companies are not within the section in question. An examination of the provisions relating to the power of railroad companies to lease, does not lead us to a different conclusion. True, by the act of 1851, it was not provided in express words that the fact that the lines of two companies were parallel and competing should be a bar to a lease by one to the other, or to a consolidation of the companies; nor was there any such express provision in the act of 1852 (3 Curwen, 1884), or the act of 1869 (3 Sayler, 1760), with respect to leasing. Express provision, however, prohibiting one company from leasing to another where their lines were competing, was made by the act of 1873 (4 Sayler, 2950), and that provision was carried into the Rev. Stats. § 3300. From the absence of any such express prohibition with respect to consolidation, it is argued that here is a legislative expression that the fact that lines are competing is no objection to consolidation. But that conclusion, in my judgment, is altogether erroneous. By the act of 1852 (3 Curwen, 1877), consolidation was provided for in section 21, and leasing in section 24. When section 24 was repealed and re-enacted with certain changes in 1869, it was left in the respect mentioned, unchanged, and such prohibition was introduced, as we have seen, in 1873, when the section was again amended. Perhaps this latter amendment was introduced by reason of some abuse which had no direct relation to consolidation, and hence the propriety of amending the section on that subject was not considered. But, however this may be, it does not follow that such change in the language of the act worked any radical change in the law. The presumption, as we have seen, is the other way, unless the purpose to require a change in the construction is clear. Notwithstanding the act of 1873, the question still is as to the fair interpretation of the section relating to consolidation previous to that time, which section is still in force in substantially the same form. Rev. Stats. § 3379. That it does not authorize a consolidation of lines bearing to each other the relation borne by these roads, is a proposition to which I fully assent.

Entertaining these views, the question how far this consolidation may be affected by the clause in the act of 1873, incorporated into section 3300 of the Revised Statutes, is not with me a vital one. But the policy of the State, as declared in that enactment, cannot be in doubt. Since 1873, at least, there can be no lease where the lines of the lessor and lessee are competing, and it is admitted that if there can be no lease, there can be no consolidation of such lines leased since then. The rule upon the subject may be more rigid since 1873 than it was under the former legislation. I do not think it is necessary to determine how that was, nor is it necessary to express any further opinion upon the question how far section 3300 might be regarded in determining this cause.

3. A fatal defect in the organization of this company is found in the fact that under Rev. Stats. § 3381, the directors of the consolidating companies must set forth in their joint agreement the places of residence of the new directors, as well as their number. This provision of the statute has not been complied with. There is no designation of any such place of residence. We are not to speculate as to the

propriety of this provision, nor as to the manner it became incorporated into the statutes in its present form. It is sufficient to say the provision is in no sense directory, and that a compliance with it is indispensable. *Atlantic, etc., R. Co. v. Sullivan*, 5 Ohio St. 276; *The State v. Lee*, 21 Ohio St. 662; *Raccoon, etc. Co. v. Eagle, The State v. Cen. O. Association*, 29 Ohio St. 238, 399; *People v. Chambers*, 42 California, 201.

The discussion by counsel has taken a wide range, and many additional reasons have been suggested in support of the views here stated; but let what is written suffice.

*Judgment of ouster.*

White and McIlvane, J. J., concur in the judgment on the grounds stated in the first proposition. As to the second, as applied to the case, they express no opinion. They also concur in the third proposition.

Johnson and Longworth, J. J., concur in the judgment, on the grounds stated in the second and third propositions, but do not concur in the first. They prepared the following separate opinions:

JOHNSON, J. In my opinion, § 3379 of the Rev. Stats. should be construed so as to hold:

1. A railroad company, having the exclusive right to manage, control, and operate a line of railroad in perpetuity, whether such right is acquired by having constructed, purchased, or permanently leased the same or part thereof, may consolidate the same with another line when the two lines are so constructed as to admit the passage of burden or passenger cars over both of said lines, continuously, without break or interruption.

2. But if such lines are, in their general features, parallel and competing, they are not *continuous* within the true intent and meaning of § 3379 of the Rev. Stats., and hence cannot be consolidated.

The facts of this case show that the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company owned a line of railroad from Cleveland to Springfield, and had acquired by contracts or leases, the right in perpetuity, to manage and operate a railroad from Springfield, via Dayton to Cincinnati. The line thus acquired was an extension of the line it owned, and the two together constituted one continuous line from Cleveland to Cincinnati, and was in legal effect an extension of the Cleveland, Columbus, Cincinnati and Indianapolis Railroad.

The Cincinnati, Hamilton and Dayton Railroad owned a line from Cincinnati to Dayton, and had by contract, acquired a like right to the railroad from Dayton to Toledo. This constituted a continuous line, under the perpetual management and control of the Cincinnati, Hamilton and Dayton Company from Cincinnati to Toledo, and in legal effect was an extension of the line of the Cincinnati, Hamilton and Dayton Road to Toledo. Each new line had for its terminus on the Ohio River the city of Cincinnati, and on Lake Erie one had Cleveland, the other Toledo. At the southern terminus, and to Dayton they were parallel and competing for all freight and passengers to Lake Erie. At Toledo and Cleveland they were competitors for business to Dayton and Cincinnati. Neither of these lines is as to the other a *continuing line*. By a consolidation they do not constitute one continuous line, but two parallel and competing lines.

If these lines can be consolidated, the new or consolidated company, does not then have one *continuous line*, but *two lines*, parallel in their general features, neither of which, as to the other, is a continuous line, nor is either as to the other an extension.

The intent of this section of the statute is, to authorize a consolidation when the lines are so constructed as to admit the passage of burden or passenger cars over two or more of them *continuously*, i. e., the two lines so consolidated will, each as to the other, be an extension, and provide for continuous transit under a single management and control, thus affording to the public greater facilities for travel and business, "*without break or interruption*," and greater unity and economy of management. Continuity of transit and efficiency, responsibility and economy in the transaction of business, under a single management, are the objects to be accomplished. Consolidation, which thus promotes the convenience of the public, is for the public benefit and is authorized, while that which does not provide for continuity of transit without break or interruption, but combines parallel and competing lines, creates a monopoly, which is against the public policy of the State.

The statute is addressed to corporations having the capacity to accomplish the main object, the continuous transit, without break or interruption.

The lessor company of a given line, has neither capacity nor power to do this. It has, by a lease or contract of a permanent nature, divested itself of any power to furnish such transportation.

The franchise to maintain and operate a railroad over the leased line, passed with the tangible property, to the lessee company. It alone can furnish the desired transportation.

The franchise or power to consolidate must exist in the corporation, having such lines as may be united, so as to furnish that continuity of transportation, which it was the purpose of the statute to provide for. A lessor company could not do this. A lessee company, having absolute control, during the life of the lessor company, can fully accomplish this object, and I see no reason why it may not consolidate when this continuity of transit will be provided, which was the primary object of the statute.

LONGWORTH, J. I concur with my brethren that judgment of *ouster* should be rendered, but not upon the ground set forth in the first paragraph of the syllabus; and I agree with the opinion of Judge Johnson. I only desire to add one consideration to what has been said by him.

In construing a statute it is always well to consider the object to be attained by legislation. In this case it is evident that the object (or at least one object), was to enable trains of cars to pass continuously, without break or interruption, over the lines of road of the companies desiring to become consolidated. As the lessee companies actually operate the roads, of which they alone have possession and control, they must certainly be the owners of such lines within contemplation of § 3379. A consolidation of *lessor* companies could accomplish no conceivable practical result, seeing that they do not operate the roads, and never can, at least while the leases are in force. This drives me to the conclusion that the "lines of road of any railroad companies" mentioned in the statute refer to lines held under perpetual lease, where

the lessee has sole possession and control of their operation, as well as to lines held and owned by title in fee simple. I concede that the title must exist in perpetuity, since the consolidated corporation will, in contemplation of law, endure forever.

This being true, it follows that the "lines of road" in question extend from Cincinnati to Cleveland and Toledo, respectively; that they are competing and in their general features parallel; and their consolidation is open to the objections so well announced and discussed in the opinion of the Chief Justice and of Judge Johnson.

## A FEW POINTS CONCERNING TRANSPORTATION IN OHIO SINCE 1802.

The past eighty years of Ohio are divided by the course of events into three periods. From 1802 until 1825, during which there were no artificial ways to facilitate the transportation of the products of the State, is the first.

The second period, from 1825 to 1852, was distinguished at first by the use of the National Road extending from Cumberland City, Maryland, to Zanesville—chiefly by a period of remarkable prosperity arising from the construction of over 800 miles of canals by the State, and ultimately by the introduction of railroads and their ascendancy as a means of transportation in 1852, when they had accomplished through lines from the leading cities of the State to the great commercial cities of the East.

From 1852 to the present time, railroad transportation has been a large factor in the prosperity of Ohio, and may properly be considered the third period.

John Kilbourne, of Columbus, O, writing in 1815, says of the rivers of Ohio, that the Muskingum was navigable 150 miles for batteaux, and by a portage of 5 miles from a small lake at its head a line of communication was formed into the Cuyahoga; thence into Lake Erie. The Hocking river was navigable nearly 60 miles, with the exception of a few falls and dams. The Scioto was navigable 130 miles, with but a few obstructions, and what few there were, were passable downward in high waters. The Great Miami was navigable for batteaux 125 miles, and by a portage of 5 miles communicated with the Maumee and thence to the lake.

With the lake on the north of the State, the river on the south, and these meager tributaries running north and south into them, were formed the only ways of commerce enjoyed by the people of Ohio during the first period of transportation.

The era of natural facilities is more particularly described by Judge Burnett, of Cincinnati, who was among the earliest settlers in the Miami country—settling there in 1796. In his "Notes on the Northwest" he says:

"One of the greatest embarrassments under which the people of the West labored at that early period, arose from the difficulty of conveying their products to market and of procuring such foreign articles in return as were required for use and

comfort. No artificial roads had been made; canals had not been thought of; the natural impediments in the rivers of the country rendered their navigation difficult and hazardous at all times, always tedious and often impracticable; and, whenever the water was at its most favorable stage, the distance of the principal markets, the imperfect means of transportation, and the low price of produce were such that a large portion of the avails of a cargo was consumed by the expense of taking it to market. The only water crafts were pirogues, flat-boats, keel boats, moved by oars and setting poles.

"The average time required to make a trip to New Orleans and back to Cincinnati was six months. The crafts made use of were necessarily small and the cargo proportionally light, and when they arrived at New Orleans in flat-boats which could not be taken back, the boats were abandoned and the hands returned by land, most generally on foot, through a wilderness, inhabited by Indians, of seven or eight hundred miles. Pirogues and keel-boats returned loaded with such articles as the market of New Orleans afforded. Under such disadvantages the commerce of the country was nominal, and nothing but necessity prompted the inhabitants to engage in it. The farmer had no motive to increase the products of his fields beyond the wants of his family, and of emigrants, or 'new comers,' as they were called, who might settle in his immediate neighborhood.

"For many years these emigrants created the only demand which existed in the interior settlements for the surplus products of agriculture. Corn and oats rarely commanded more than ten or twelve cents per bushel; they were frequently purchased at eight cents, and wheat from thirty to forty cents. The average price of good beef was one dollar and fifty cents per hundred, and pork from one to two dollars, according to quality. At such prices it is evident that following the plow was not the road to wealth; and yet the farmers lived independently and enjoyed as much real comfort as they have at any period since. They were content with plain healthful food, produced by their own hands, and the simple, comfortable dress they were enabled to acquire. On every farm was to be seen a small flock of sheep and generally a patch of flax, and in the cabin always a spinning wheel and occasionally a loom.

"They did not crave luxury or show, because they were not enjoyed by their neighbors, and they were content to live and appear in the same style as others did with whom they associated. But those days of simplicity have passed away."

After drawing this simple picture of real life at that time, the same writer describes the first attempt at the formation of an exporting company:

"During this period of depression, when the produce of the country would not defray the expense of transportation to a distant market, the project of the Miami Exporting Company was got up. The plan was first suggested by Mr. Jesse Hunt, an experienced merchant and pioneer. For the purpose of eliciting information he proposed the question to the merchants of Cincinnati and the farmers of the neighborhood, whether a plan could not be devised which, with the aid of corporate powers, would enable them to make such arrangements as would put it in their power to reduce the difficulty and expense of transportation, so far as to make it an object to collect the produce of the country and ship it to New Orleans."

Mr. Hunt, with aid of some friends, drafted a plan of a charter for the transportation company, into which was introduced a provision on which the banking powers of the company were founded.

The experiment as a transportation company was fairly tried and found to be a failure.

He further says:

"The inhabitants of the country in 1803, when the Miami Exporting Company was organized, may discover the reason why it was got up and sanctioned by the Legislature without looking beyond the objects expressed in the charter. The great improvements effected in the business facilities of the country since that period by the constructing of roads, bridges and canals, by the improvements of river and lake navigation, and above all, by the successful application of steam-power to manufacturing, traveling and commercial purposes have driven from memory the difficulties and embarrassments of primitive times, and given the appearance of fable to the most faithful description of facts, as they existed before and for some years after the formation of the State government.

"The improvement in the navigation of the West and her commercial operations was in the introduction of barges moved by sails, when the wind permitted, and at other times by oars and setting poles, as the state of water might require. These vessels were constructed to carry from fifty to a hundred tons. In the best seasons, if properly managed, they could make two trips between Cincinnati and New Orleans in a year. The increased quantity of cargo they carried reduced the price of freight, and enabled them to transport from New Orleans to Cincinnati *at from five to six dollars per hundred, which was below the average charge of carriage across the mountain.* From that time most of the groceries and other important articles used in the territory were brought up the river by these barges, and as the price of freight was diminishing, the quantity of produce shipped was proportionally increased. The introduction of this mode of navigating the Ohio and Mississippi was an epoch in the history of the West. It was viewed as an improvement destined to advance both her commercial and agricultural interests.

"The project was suggested and carried into operation by two commercial houses in Cincinnati, Messrs Baum & Perry and Messrs. Riddle, Bechtle & Co. The vessels which they constructed were all adapted to the purpose for which they were designed, and continued in use till the introduction of steamboats about the year 1817."

The introduction of steamboats upon our rivers and lakes quickened the enterprise of the people, and various schemes for facilitating the transportation of freight were discussed everywhere throughout Ohio, until finally Governor Brown, in an inaugural address made December 14, 1818, expressed himself in general terms concerning internal improvements, as follows:

"If we would raise the character of our State by increasing industry and our resources, it seems necessary to improve the internal communication and open a



cheaper way to market for the surplus produce of a large portion of our fertile country."

In more specific terms as to the means to be used to improve our internal communication, Mr. Sill, a member of the House of Representatives from Ross county, moved the following resolution on the 7th day of January, A.D. 1819:

*"Resolved by the Senate and House of Representatives, That a committee, consisting of five members on the part of the House and — members on the part of the Senate, be appointed to take into consideration so much of the subject of internal improvements as relates to the construction of a canal connecting the waters that flow into Lake Erie with those that flow into the Ohio river, and that said committee be instructed to inquire into the expediency of authorizing the Governor to procure one or more skillful engineers for the purpose of exploring and ascertaining the most eligible routes for the foundation of said canal, and that said committee report thereon by bill or otherwise."*

These were the first official words setting into motion the great activities of the people in the enlightened work of internal improvement, upon which they soon entered, and out of which has grown the most wonderful development of wealth Ohio has yet realized.

Governor Brown, in his message of January 8, 1819, said:

"You will bear in mind that our productions which form our only great resource are generally of the bulky and ponderous description as to need every easement in conveyance that we can afford. Experience is a faithful monitor, and the millions expended for transportation during the late war may teach us a useful lesson; another may be learned from the present difference between the price of salt on the lake shore and on the Ohio. I have already evinced an anxiety upon this subject, excited by a strong sense of its vital importance; roads and canals are veins and arteries to the body politic that diffuse supplies, health, vigor and animation to the whole system; nor is this idea of their extension and beneficial influence new.

"The evidence of the Old World is ample—in the United States sufficient. Massachusetts, Virginia, North and South Carolina have proved the usefulness of artificial navigation.

\* \* \* \* \*

"Nature strongly invites us to similar enterprises."

December 2, 1820, W. Steele, of Cincinnati, addressed a letter to Governor Brown on the project to connect Lake Erie with the Ohio river, among other things saying:

"Persons unacquainted with the cheap rates at which goods are transported on canals, are surprised when they learn that a ton weight can be transported at the rate of one cent a mile. The illustrious Fulton, but a short time previous to his

death, gave it as his opinion that goods could be transported on the New York canal when completed at the rate of one cent per ton per mile. \* \* \* \* \* If Mr. Fulton's estimate, as to the expense at which goods can be transported on canals be correct, the expense of transporting a barrel of flour to the city of New York (allowing ten barrels per ton) will be as follows:

From the Ohio river to Lake Erie, 200 miles =	20 cents.
Down Lake Erie, 260 miles =	20 cents.
Through the N. Y. and Erie canal, 353 miles =	35 cents.
Down the Hudson to N. Y. City, 160 miles =	15 cents.

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973 miles = 90 cents.\*

"To this must be added the tollage through both canals. The lowest rate at which flour is at present freighted to New Orleans from the Falls, is 1.25 per barrel."

An act of the Legislature of Ohio, passed February 23, 1820, proposed the "Commissions for locating a route for a canal between Lake Erie and the Ohio river," but having been made to depend on the accession of Congress to the proposition of the General Assembly for a purchase of land, the Commission was not appointed.

An act of the Legislature of Ohio, passed January 31, 1822, proposed that the "Governor employ an approved practical engineer, whose duty it shall be to make such surveys and examination of country between Lake Erie and the Ohio river, with a view to ascertain the practicability of uniting those waters by a navigable canal, as is directed in the act."

By said act Benj. Tappan, Alfred Kelly, Thos. Worthington, Ethan A Brown (ex-Governor), Jeremiah Morrow, Isaac Miner and Ebenezer Buckingham, Jr., were appointed Commissioners, whose duty it was to cause an examination, surveys and estimates to be made to ascertain the practicability of connecting Lake Erie and the Ohio by routes from Sandusky Bay to the Ohio river; Maumee river to the Ohio river; from the lake by the sources of the Cuyahoga, Black and Muskingum rivers; and from the lake by the Grand and Mahoning rivers to the Ohio river.

The first report of the Canal Commissioners was made January 3, 1823, by Wm. Worthington.

James Geddes, Civil Engineer, also made a report of the surveys made at the same time.

Nine hundred miles had been examined, and the level of nearly 800 miles had been accomplished in 8 months, at an aggregate expense of \$2,426.10, the Commissioners not having charged anything for their time.

By an act of the Legislature January 27, 1823, Micajah T. Williams was made commissioner in place of Jeremiah Morrow, resigned (elected

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\* Now, in 1881, transported for 35 cents per barrel from Cincinnati, O., to New York.

Governor). The Board were required to procure right-of-way, and ascertain if loans could be made in behalf of the State, and report.

The second annual report of the Canal Commissioners was made January 21, 1824.

February 23, 1824, another act of the Legislature was made, requiring further examination into the practicability of connecting Lake Erie with the Ohio river by a canal.

On the 25th of February, 1824, Nathaniel Beasley was made a Canal Commissioner, by a concurrent resolution of both branches of the Legislature.

January 8, 1825, the third annual report of the Board of Canal Commissioners was submitted to the General Assembly, and on the 4th day of February, A.D. 1825, an act was passed to provide for the internal improvement of the State of Ohio by navigable canals, by a vote in the House, 58 to 13; in the Senate, 34 to 2.

#### THE NATIONAL ROAD.

During this period our National Government entered upon a scheme of internal improvements. Of these the National Road, or Cumberland Road, was one. It commenced at Cumberland, in Maryland, running thence westward to the Ohio river, through the State of Pennsylvania, and thence through Central Ohio.

The first appropriation made for this purpose was in 1806, when Congress voted \$30,000 to make a survey of route and report. It was subject to the approval of the President. Having gained this, appropriations were made from time to time thereafter until 1838, when a little over three millions of dollars had been expended by the General Government in this work; about 1825 the people of Eastern Ohio began the use of this great route—its first artificial means for the transportation of its commerce.

This great road opened the way through the mountain barriers of the Allegheny range, and made level a way for the commerce of the East, and for the pioneer and his family, who were seeking homes in the wilds of Ohio and the further West. It was the first great movement of the people in the direction of internal improvements, and distinctly marks the opening of a new era in the history of Ohio.

The building of the National Road was entered upon by Congress, in the view that it would afford a way for the transportation of the munitions of war, and that it would also prove a bond of union.

Henry Clay, in advocacy of such improvements, said:

"Whether we refer to our own experience or that of other countries, we cannot fail to perceive the great value of military roads. Those masters of the world—the Romans—how did they sustain their power so many centuries, diffusing law and liberty, and intelligence around them? They made permanent military roads, and among the objects of interest which Europe now presents, are the remains of the Roman roads, which are shown to the curious enquirer. \* \* \* \* No man who has paid the least attention to the operation of war, can have failed to remark how essential good roads and canals are to the success of these operations."

This is quoted to show how far short the brilliant dreams of one of the most eminent orators of America were to the more brilliant reality that distinguished the growth of our country within a few years after his decease. He thought himself building great highways for the future armies of America. In the war of the great rebellion the government never found itself indebted to the utility of the National Road in facilitating the march of armies.

The progress in building the National Road was slow. An appropriation was made March 2, 1825, for extending it westwardly from Zanesville. It had a great deal, however, to do with the great prosperity of Ohio that distinguished

#### THE SECOND PERIOD, FROM 1825 TO 1852.

In 1825 Ohio entered upon the construction of her canals, and in 1832 the Canal Commissioners reported 400 miles of navigable canals completed.

This enterprise of the State was subject to many vicissitudes, involving at times questions of public policy that divided our legislators in their opinions and greatly excited the people. Among others was the acceptance of a half million acre land-grant, made by Congress, to aid the State in paying the debt incurred in the building of the canals, and that which might thereafter be contracted in completing their construction. The act was conditional, that the canals already commenced should be completed in seven years. There was, also, in the same act, a proposition to aid the extension of the Miami canal from Dayton to the lake, by the Maumee route, by grant of land equal to one-half of the two sections in width on each side of the canal from Dayton to the Maumee river, on the express condition that this extension should be completed within 20 years, or the State should pay the United States the price of the lands, and that the Ohio Legislature give its assent to the conditions. The Legislature refused their assent.

During the years 1829 and 1830, Judge Burnett, U. S. Senator, suc-

ceeded in securing the enactment of this statute without the conditions and penalty, including, also, an additional grant of 160,000 acres of land. The completion of the Miami canal was undoubtedly effected by the good management of Judge Burnett in the United States Senate.

#### THE OPENING OF THE FIRST OHIO CANAL

Was accomplished July 4, 1827. An account of the same is made by Governor Trimble, in his message to the Legislature December 4, 1827, in words as follows:

"The northern section of the Erie and Ohio canal, presenting the most difficult and expensive part of the line, was opened early in July, last. On the 4th, the first boat descended from Akron, a beautiful village on Portage Summit, to Cleveland. She was cheered in her passage by thousands of our delighted fellow-citizens, who assembled from the adjacent country at different points on the canal to witness the novel and interesting sight. The gentle descent of a boat of fifty tons burthen from an eminence of 400 feet, consummating, on the day of American Independence, the union between the waters of the North and South, presented a scene grand beyond description, and could not but have awakened, in all who beheld it, feelings of the most exalted patriotism and devotion to the cause of internal improvements."

#### THE BOARD OF CANAL COMMISSIONERS,

In a report dated January 5, 1828, reported the opening of the Miami and Erie canal in these words:

"On the 28th day of November, three fine boats, crowded with citizens, delighted with the novelty and interest of the occasion, left the basin six miles north of Cincinnati and proceeded to Middletown with the most perfect success. The progress of the boats was equal to about three miles an hour, through the whole course of the time, including the detention at the locks and all other causes of delay, which are numerous in a first attempt to navigate a new canal, when master's hands and horses are inexperienced, and often the canal itself in an imperfect order. The boats returned to the basin with equal success, and it is understood have made several trips since, carrying passengers and freight. The success of these experiments in canal navigation, and the obvious facility with which heavy burthens were moved by the power of even a single horse, must go far to convince the most incredulous of the high interest and importance of such a channel of commercial intercourse passing through the heart of a country as populous and productive as that through which the canal passes."

The following table is the earliest schedule of rates that can be found. This is a selection of a few items, significant of the rates prevailing at that time:

RATES OF TOLL MADE BY THE BOARD OF CANAL COMMISSIONERS AT COLUMBUS, FEBRUARY 23, 1830.

	100 miles and less, per ton per mile, cents and mills.	Over 100 miles, per ton per mile, cents and mills.
Merchandise .....	4.0	3.0
Iron .....	3.0	.....
Hollow glassware and hardware .....	2.0	1.5
Wheat, flour.....	1.5	.....
Baggage.....	1.5	.....
Furniture .....	1.5	.....
Salt .....	1.5	1.0
Corn, oats, rye, barley .....	1.0	0.7

Ranging from 1 cent to 4 cents per ton per mile.

In the report made by B. Tappan, Alfred Kelley, and others, in 1832, they write of the importance of the facilities for transportation created by the opening of these great commercial channels, and say :

“As the expense of transporting any article to market is diminished, its value at the place from whence it is sent is increased. Thus we find the present price of wheat in the center of our State from fifty to seventy-five cents per bushel, while it was formerly worth from twenty-five to thirty-seven and one-half cents, and where its value at this time would be no greater than formerly, had not the Ohio canal been constructed. The same remark is equally applicable to various other productions. Many articles, to which no value whatever could be attached, as articles of exportation, are now advantageously sent abroad for sale.”

To show how the State had been the gainer, although the revenue from the canals was not sufficient to pay, the report says that during the year past there arrived at Cleveland 288,722 bushels of wheat, via the Ohio canal and 54,404 barrels of flour, equal to 560,742 bushels of wheat, on which there was an average saving of 20 cents per bushel; 13,801 barrels of pork, saving at least \$1.25 per barrel; 353,101 barrels of lard, saving at least one cent per pound; 666,949 pounds of butter, saving one cent per pound; 2,150 barrels of whisky, saving \$1.00 per barrel; 85,711 pounds of cheese, saving one-half cent per pound; 965 hogsheads of tobacco, saving \$1.00 per hogshead; 656,949 feet of lumber, saving \$2.00 per thousand; 261,026 pounds of pot and pearl ashes, saving one cent

per pound; 12,900 bushels of mineral coal, and in general, rough stone, cord-wood, oil, flax-seed, corn, oats, making a saving of \$156,871.85; and in a like estimate upon imports to the interior of Ohio, and also the Miami canal, together with tolls charged there is an aggregate saving, estimated at \$312,156.87, while the Auditor's estimate of interest on canal loans for the State was \$169,004.51. The advantages have not been confined to the immediate vicinity of the canals. Even those parts of the State situated remote from the canals and near the Ohio river have participated in them. Much of the produce which was formerly forced into the same market and tended to depress the price, now finds an outlet in another direction, and prices are enhanced by a competition between purchasers.

Such was the view after the canals were fairly inaugurated.

From 1832 to 1852, *the influence* of the canals and the National Road was the most important factor in the State's prosperity.

With the canals extending from the lake to the Ohio river, north and south, and the National Road from east to west near the centre of the State, the situation was exceedingly flattering to the people, and prosperity was wide-spread. The valuation of real and personal property in Ohio in 1832 was \$74,243,032.

From 1832 to 1852, were the effective years of the canals of Ohio in developing its resources. It is true, the first of our railroads was opened in 1845, but through lines were established in 1852.

The valuation of the real and personal property of Ohio in 1852 was \$508,581,911, an increase of 378 per cent., and the increase of population during this time was about 111 per cent.

In 1847 the receipts from the canals amounted to \$805,019, and in 1851 to \$836,352; these were the largest amounts ever received.

The tonnage in 1851 was, "Received at Cleveland, Portsmouth, Toledo and Cincinnati, 670,980 tons." Cleared from the same places, 220,097 tons. This was the culminating year in the history of canals.

The subjoined is a showing of freight rates prevailing upon the canals from 1848 to 1852 upon a few of the leading articles shipped:



ON EACH 1,000 POUNDS; IN SAME PROPORTION FOR GREATER OR LESS WEIGHT.

	Miami and Erie.		All other canals.	
	Mills.	Not to exceed	Mills.	Not to exceed
Iron .....	15	200	15	200
Merchandise .....	20	250	20	250
Salt .....	12	170	12	.....
Baggage .....	20	250	20	.....
Hardware .....	15	200	15	.....
Corn .....	6	75	6	75
Wheat .....	7½	.....	9	125
Furniture .....	20	250	20	.....

A range of from 1.2 cents to 5 cents per ton per mile, an increase over the rates of 1830.

The following table shows the growth of freight and the per cent. on the cost realized each year, from 1833 to 1850, on the Ohio canal, 334 miles:

Year.	Gross receipts.	Net revenue.	Interest on cost of construction.
1833.....	\$136,555 70		
1834.....	164,488 98	\$84,775 30	1.9
1835.....	185,684 48	103,973 33	2.3
1836.....	211,823 32	120,421 06	2.7
1837.....	293,428 79	169,965 57	3.8
1838.....	382,135 96	181,897 06	4.0
1839.....	423,599 84	219,890 19	4.9
1840.....	452,122 03	329,872 38	7.3
1841.....	416,202 63	282,749 10	6.3
1842.....	387,442 22	248,276 35	5.5
1843.....	322,754 82	96,708 58	4.3
1844.....	343,710 99	222,058 78	4.9
1845.....	260,369 33	133,995 10	2.9
1846.....	336,339 69	257,906 60	5.7
1847.....	452,530 76	331,802 52	7.4
1848.....	418,530 37	280,027 09	6.2
1849.....	362,630 48	242,347 34	5.4
1850.....	397,332 57		

## DISCRIMINATIONS AND JUSTIFICATIONS.

It seems from the records of the Canal Boards, that they found occasion to make "discriminating rates" more favorable to one line of traffic than to another. E. S. Hamlin, and his associates, thus discuss the problem in their report, dated December 29, 1851:

"A rate of toll considerably below the maximum rate was established from and to Dayton and Toledo, and Dayton and Cincinnati; from and to Cleveland and Columbus, and Columbus and Newark, and from and to Columbus and Portsmouth, and on a few articles of produce along the section of country between Columbus and Newark to Cleveland. The great difference in distance between important points in this State and the lake shore, in favor of the railroads, induced the Board to express the opinion in their last annual report, that to secure a portion of the carrying trade an exceedingly low rate of toll must be adopted. The railroads, however, fixed a

rate of transportation from the points before mentioned below their uniform rates, and thus compelled the Board to adopt very low rate of tolls to be charged from and to them.

"The maximum rate of tolls on wheat, flour, pork, whisky, etc., on the Ohio canal, is one dollar per 1,000 pounds, and this maximum is attained at 175 miles south from Cleveland, which point is east of Newark. Yet, from Newark to Cleveland, only 70 cents per 1,000 pounds, and from Columbus to Cleveland, only 60 cents per 1,000 pounds are charged as tolls on their articles.

"Complaint has been made of this special rate of tolls; it is alleged that its effect is to build up certain points which are favored by it. \* \* \* But, if this be not done, but a contrary policy adopted, and the tolls kept at a point that will throw the business from them to railroads, a large number of valuable citizens, who have in many cases all that they own invested in boats and stocks, and business houses on the canals, will be greatly injured and in some instances ruined; and the revenue from the public works will sink into insignificance, and the works ultimately go to decay.

"The discriminating principle which the Board has adopted from Columbus to Cleveland, and other like cases, is one liable to great objection, and the Board would not tolerate it only from necessity."

#### RAILROAD ERA.

From 1852, when there were 890 miles of railroad in operation, until 1869, when there were 3,324 miles, there was great activity in the building of railroads in Ohio.

#### TRUNK LINE EXTENSIONS BY CONSOLIDATIONS.

In 1869 an important change was accomplished in railway management by the consolidation of railroads into through lines, connecting Chicago with the Atlantic cities. The act providing for consolidations was passed by the Ohio Legislature in 1851, and was perhaps the earliest act of the kind in any of the states. Many minor consolidations of railroads took place prior to the formation of through lines.

The first of the through lines was formed by the execution of a lease between the Pittsburgh, Cincinnati and St. Louis Railway Company and the Columbus, Chicago and Indiana Central Railway Company, dated January 22, 1869, to take effect February 1, 1869. The Pennsylvania Railroad Company was the third party to the contract. This was the first through line formed between Chicago and the sea-coast.

In December, 1869, the Little Miami Company, as at that time constituted, was added to this combination, making a branch from Columbus to Cincinnati.

A second through line was formed in 1869, by the lease made by the

Pittsburgh, Fort Wayne and Chicago Railway Company to the Pennsylvania Railroad Company, dated June 27, 1869, to take effect July 1, 1869.

A third through line was formed the same year by the consolidation of the several railroads along the lake shore, into the railway known as the Lake Shore and Michigan Southern Railway Company, by an agreement dated June 22, 1869, and ratified August 10, 1869.

With one exception, all the through lines passing through Ohio at this time, were formed in 1869. The Baltimore and Ohio through line became such December 1, 1874.

These through lines were western extensions of the three trunk-lines—the Pennsylvania Railroad Company, the New York Central and Hudson River Railroad Company, and the Baltimore and Ohio Railroad Company—the Pennsylvania Railroad Company making two through lines before any others were formed.

These long lines, unbroken in their management, it is claimed, “are, practically, arrangements for the more economical, commodious, safe and perfect operation of several lines of railroads so located and situated with reference to each other, that they may be operated under a single organization and in connection with each other. By these arrangements the business that comes within the scope of each and all of them is carried on more safely and commodiously and expeditiously, and consequently more cheaply, both to the stockholders and the public, than when each of them is managed and operated separately; and thus the interests of the respective owners of the property are promoted, while at the same time the public at large get safer, more expeditious, and cheaper means of transportation.”

It is, therefore, thought proper to gather what evidence there is in statistical statements concerning this period, since 1869, that it may be seen whether or not transportation is cheaper and more economical by reason of this consolidation management.

The following table, dating back to 1869, shows the growth of freight traffic and the accompanying decline in rates; this showing involves all the roads making reports to the Commissioners of Railroads—including what lines they have beyond the borders of the State—excepting the Lake Shore and Michigan Southern, which reports only for the part in the State:

Year.	Tons of freight moved one mile.	Average rate per ton per mile, cents.
1869.....	1,332,307,931	2.446
1870. ....	1,673,017,568	1.993
1871.....	1,773,983,405	2.215
1872.....	2,923,292,084	1.569
1873.....	3,420,889,453	1.566
1874.....	3,717,622,979	1.334
1875.....	3,431,745,707	1.259
1876.....	3,799,397,649	1.117
1877.....	4,146,926,306	.933
1878.....	4,286,378,592	.961
1879.....	4,914,503,869	.815
1880.....	6,655,562,182	.895
1881.....	7,607,215,616	.915

The gain from 1869 to 1881, in the tons of freight moved, is 463.4 per cent. The decline in the rate charged is 62.6 per cent. ; the average in 1869 being 2.446 cents per ton per mile, and in 1881, .915 cents—that is, the amount of service rendered by the railroads during this period has increased 463, while the compensation for moving each ton one mile has decreased over 62 per cent.

The following table shows the number of tons of freight moved one mile in Ohio alone from 1869 to 1881, inclusive, with accompanying rate for each year; also, the amount of rate cut off compared with the rate of 1869; also, the amount saved thereby, and this amount compared with the amount of taxes of all kinds upon the grand duplicate of Ohio during that time.

From this table it will be seen that by the decline of rates, since 1869, there has been saved to those who are charged with the cost of shipping—the producer and consumer—the sum of \$337,674,755.99; and that during that time all of the taxes of Ohio of whatever kind amounted to \$315,966,996.34, an amount less than the amount saved to shippers by \$21,707,759.66.

Year.	Ton-miles. Proportion for Ohio.	Average rate per ton per mile, cents.	Decrease from 1869.	Amount saved.	Total taxes in Ohio.
1869 .....	739,031,209.33	2.446	.....	.....	.....
1870 .....	898,410,433.02	1.993	.453	\$4,073,899 26	\$23,463,631 82
1871 .....	938,259,822.90	2.215	.231	2,167,380 19	22,955,388 40
1872 .....	1,494,094,584.13	1.569	.877	13,103,209 50	23,810,971 97
1873 .....	1,941,012,675.53	1.566	.880	17,080,911 54	26,131,353 23
1874 .....	2,147,299,032.67	1.334	1.112	23,877,965 24	26,837,196 77
1875 .....	1,917,659,501.07	1.259	1.187	22,762,618 28	27,952,971 37
1876 .....	2,117,024,370.02	1.117	1.329	28,135,253 88	28,521,256 52
1877 .....	2,360,015,760.74	.933	1.513	35,707,038 46	27,514,650 79
1878 .....	2,493,815,064.83	.961	1.485	37,033,153 71	26,324,445 30
1879 .....	2,741,310,258.11	.815	1.631	44,710,770 31	25,756,665 61
1880 .....	3,393,814,541.62	.895	1.551	52,638,063 54	29,092,084 27
1881 .....	3,681,892,358.14	.915	1.531	56,384,592 08	27,606,380 29
	Total .....		62.6 %	\$337,674,755 99	\$315,966,996 34
	398.2 %				

The foregoing tables give the result of the varied work of all the railroads of the State. The general fact is seen, that following 1869 there has been a great decline in railroad rates for freight. It is of course not apparent from these facts that this decline is to be attributed to the consolidated lines, nor that they have done more to this end than other roads. To get a view of the relative agencies of these two classes of roads another table is submitted, which includes a showing of two of the great through lines, the Pittsburgh, Fort Wayne and Chicago and the Lake Shore and Michigan Southern Railways. In this is shown the actual cost to the company, the rate charged, or earnings, and the profit; also, the average yearly rates on all the roads of Ohio. To give a view beyond this State, three of the great trunk-lines of New York and Pennsylvania, with like showings, are included:

[illegible]



The other through lines of Ohio have not made their reports so that an exhibit of their results, like the foregoing, can be made. But sufficient is known in general of the managements that the remaining lines of the Pennsylvania Company and Baltimore and Ohio have results comparatively near the exhibit of the two through lines of Ohio above given.

Another table is given showing the results of management, limited in its range. Some of the roads are local, or disconnected lines. The reports of the companies are in such terms generally, that cost of transportation to the company and the profit can not be given:

Year.	Cincinnati, Hamilton and Dayton Railroad— Average charges.	Cleveland, Mt. Vernon and Delaware Rail- road—Average charges.	Columbus and Hocking Valley Railroad— Average charges.	Ohio and West Virginia Railway—Av. charges.	Columbus and Toledo Railroad—Av. charges.	Scioto Valley Railway— Average charges.	Cincinnati, Sandusky and Cleveland Rail- road—Av. charges.	Cleveland, Tuscarawas Valley and Wheeling Railway—Av. charges.	Iron Railroad—Average charges.
	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
1869.....	2.64						2.58		8.91
1870.....	2.69	7.00					2.50		
1871.....	2.63	6.81					2.00		8.00
1872.....	2.71	6.76	1.62				1.85		8.00
1873.....	2.78	3.26	1.69				Not given.		8.06
1874.....	2.51	2.57	1.78				3.05		8.84
1875.....	2.32	2.48	1.86				1.94	1.79	7.92
1876.....	1.93	2.24	1.59				1.42	1.64	5.87
1877.....	1.62	2.07	1.55		1.33		1.41	1.42	5.77
1878.....	1.67	1.86	1.23		.94	2.94	1.63	1.24	5.30
1879.....	1.54	1.72	1.20		1.14	2.12	No report.	1.21	4.88
1880.....	1.56	1.62	1.22		.87	1.66	1.40	1.17	4.28
1881.....	1.47	(a) 1.69	1.12	2.48	.82	(b) 1.59	Not given.	1.11	(c) 4.16

(a) Cost of transportation to the company for 1881 = 1.43 cents per ton per mile.

(b) Cost of transportation to the company for 1881 = 1.10 cents per ton per mile.

(c) Cost of transportation to the company for 1881 = 3.25 cents per ton per mile.

It will be found from this showing that upon some good, unconsolidated railroads in Ohio the actual cost of transportation is far above the

average charges of the State. There is but one of these roads that attains to a cheapness less than the State average—that is the Columbus and Toledo Railroad, a well managed road, paying, by an average charge of  $\frac{8.2}{100}$  of a cent per ton per mile, the sum of  $9\frac{1.7}{100}$  per cent. upon its stock and debt.

The railroads in this list are among the best of the unconsolidated roads.

By recurrence to the table showings for the consolidated routes, it will be seen that the Lake Shore and Michigan Southern Railway has reduced the actual average cost for the transportation of a ton of merchandise, for the distance of one mile, to  $\frac{4.4}{100}$  of one cent; the profit realized by the charged rates of  $\frac{7.1}{100}$  of one cent, is  $\frac{2.7}{100}$  of one cent. Upon such a basis of cost, charge and profit, with a capital stock and debt of \$87,189,000. it made a payment of 7 per cent. upon its debt, and an 8 per cent. dividend upon its capital stock, retaining, undivided, a surplus of over \$821,000 of net earning.

The Pittsburgh, Fort Wayne and Chicago Railway has reduced the actual cost of the same work to  $\frac{4.6}{100}$  of a cent, making a charge of  $\frac{8.5}{100}$  of one cent, and realizing  $\frac{3.9}{100}$  of a cent profit upon each ton per mile. At the same time, the company operating this road paid 7 per cent. upon the value leased, and made a dividend of  $4\frac{3}{100}$  per cent. upon the capital stock and debt of the operating company, amounting to \$40,923,185.

The New York, Pennsylvania and Ohio average charges for like work were .71 cent; Wabash, St. Louis and Pacific, .89 cent; Pittsburgh, Cincinnati and St. Louis, .81 cent; Cleveland, Columbus, Cincinnati and Indianapolis, .76 cent.; with approximate apportionments of the same for cost and profit, but not to be definitely stated, since not appearing in their respective reports.

If such is the showing of consolidated railway routes in Ohio, they have at least made evident the extreme cheapness to which transportation has attained under the economy, that it has been claimed, belongs to and is characteristic of such management.

The foregoing has been written, that something of a general view may be gained of what are the facts concerning this one branch of industry in Ohio since its formation as a State, covering a period of 80 years.

There are parts of it that may be said to be foreign to an annual report on the railroads of Ohio. Yet, fully to understand the facts of to-day, it has been thought proper enough to draw somewhat upon the past. In the fearful and crushing struggle of the selfish present, a view of the patriotic self-sacrifice of our fathers, so apparent in their efforts to

put the people of the State in a good condition for their rivaling march on the pathway of civilization, may serve to remind us as to whom we are indebted for the noble impulse that has brought about such results.

If these statements and figures will afford the citizen any better and more satisfactory view of the transporting industries that have grown up to such colossal proportions within a few years of the past, the purpose of this article will have been attained.

#### OVERCHARGES AND DISCRIMINATION IN RATES.

During the past year comparatively few complaints have been made against railroad companies for overcharges or unfavorable discrimination.

The greater proportion of these complaints have been for overcharges for the transportation of merchandise for distances less than thirty miles, in which the amount charged was more than that fixed by section 3375 of the Revised Statutes for a distance of thirty miles or more, and the weight a ton or more.

This section limits such freight charges to five cents per ton per mile, "and when the quantity is transported a less distance than thirty miles, such reasonable rate as may be from time to time fixed by the corporation or prescribed by law."

It has been decided by the Supreme Court of the State in the case of *Smith v. Railroad Co.*, 23, O. S., 10, *Campbell v. Railroad Co.*, *Ib.*, 16, "that a rate for a distance less than thirty miles, which exceeds the maximum allowed for fully thirty miles, is, as a matter of law, unreasonable to the extent of the excess."

Upon the attention of the proper authorities in the railroad companies being called to this law, proper adjustments have been immediately made.

Complaints concerning discriminations have been most generally a matter of statement, not desiring to enforce a correction.

There has been a great deal said concerning discrimination made by those in the management of the freight traffic of railroads, discrimination in favor of competing points against non-competing points, and in favor of one individual against another. There is no question but that this is an evil of great extent throughout the State.

Legislation has been sought to remedy it. But only limited legislation in this direction has been secured.

The remedy at common law seems sufficient, if the aggrieved would seek that means of redress.

The business man is loth to go to law. He perhaps feels that the State should provide statutory remedies, and through the supervision of the Railroad Commissioner execute the law, that the private individual may not be compelled to enter into a long, and costly struggle with a wealthy corporation, which has skilled attorneys everywhere ready to baffle and defeat.

The shelter and protection afforded by the common law is strongly indicated in the following opinion that :

“RAILROADS CAN NOT DISCRIMINATE IN RATES.

“In a recent charge to a jury rendered by Judge Baxter, of the United States Circuit Court, wherein Hays & Co. were plaintiffs against the Pennsylvania Railroad Company, operating the Cleveland and Pittsburgh Road, more than usual importance is attached to it. The suit was instituted upon the subject of the rights and duties of railroad carriers in discrimination in freight rates. The decision is of vital importance, both to railroads and shippers. After reviewing the claims of the parties to the suit, the Judge, in his charge to the jury, in substance said :

“But as a correct appreciation of the rights and duties of railroad carriers may aid you in the discharge of the duty which the law imposes upon you, of correctly deciding upon the facts, a few general observations touching the matter will not, I trust, be considered inappropriate.

“Railroads are quasi-public highways. If the Legislature of your State were to enact a statute purporting upon any pretext whatever, to authorize one or more persons, either with or without compensation, to take private property and appropriate the same to his or their private use, the Courts would, under the responsibilities imposed upon them by the Constitution, be bound to declare the same unconstitutional and void. It is only upon the hypothesis that railroads are quasi-public highways, that the Legislature can constitutionally invest them with authority to condemn private property to their use. And being such highways, every individual constituting a part of the public, for whom railroads are constructed, possesses the right to equal privileges and accommodations in their use. If the law were otherwise, as you can readily see, the business interests of individuals and communities would be, to a greater or less extent, dependent on the favor of railroad officials. If a railroad corporation could with impunity carry the same class of freight over the same road and between the same points for one man or class of men at a less rate than they exacted from other and competing interests; if they could lawfully require one man to pay fifteen cents per bushel for the transportation of wheat from Cleveland to New York, while they did the same service for another and rival merchant for ten cents; or bring other merchandise for certain favorite friends and refuse to carry for others—they could make and unmake the fortunes of whomsoever they chose. Railroads, whose capacities for good and evil were not fully comprehended a quarter of a century ago, are now regarded as essential to the rapid development and prosperity of the country. No one can at this time successfully compete in manufacturing, mining or in commercial pursuits without the use of railroads. They have pretty much superseded every other mode of inland transporta-

tion, and if their manipulators are authorized, for any reason, sinister or otherwise, to invidiously discriminate against one man or community, in the interest of other and rival interests, they would be in the possession of a power which, skillfully exerted, would demoralize trade and extinguish honest competition to the impoverishment of those they disliked and the enrichment of their favorites. Now, if by chance selfish and ambitious men ever acquire control of any considerable number of roads, they could, by disfavoring the refractory and rewarding the obsequious, largely control both business and public sentiment within the radius of their influence, and thus increase their individual fortunes and strengthen their power.

"I am glad, gentlemen, to be able to say that railroad corporations are invested with no such dangerous power. Their officers are, in a qualified sense, trustees for the public, as well as for the shareholders, and are, in law as well as in morals, bound to execute the trusts imposed upon them by their charters, so as to secure to every one applying therefor equal facilities in the use of their roads and upon the same terms.

"You are to decide in this case whether there have been any discriminations made against this plaintiff. It is conceded that the schedule freight rates for 1876, from Salineville to Cleveland, were \$1 60 per ton on the first 8,000 tons shipped, thirty cents less on the next 8,000 tons, forty cents less on the third 8,000 tons, fifty cents less on the fourth 8,000 tons, and sixty cents less on the fifth 8,000 tons, and on all coal in excess of the last amount transported for any one man or firm. The effect of this rebate was to give to the heaviest shipper better rates than shippers of less amount enjoyed. Is such a discrimination authorized by law? I wholly dissent from the proposition that is. If such a rebate is authorized in shipping coal, it is in transporting wheat or any thing else transported in large quantities. The effect of such a policy would be to add to the strong and crush out the weak. If you find higher rates had to be paid by the plaintiffs than were exacted from others, such a discrimination is wrong to the plaintiffs, and they are entitled to reclaim what they overpaid, with interest.

"The plaintiff further alleges that the defendants owned or controlled a dock, used by or connected with the railroad. The plaintiff applied for the use of the dock and was refused it, while others were allowed to use it. It was said by defendant that there was no room on the dock for any but the three persons entitled to use it. That is not a sufficient defense. All customers are entitled to equal chances for using the dock, and the plaintiff had as much right to it as the others had. But as no proof has been introduced by which the estimate of the damage done the plaintiff from this exclusion from the dock can be found, I can not submit the question of damages to pay.

"The plaintiffs stated that their business was ruined by the discriminations, and ask for damages on that account. At the beginning of the trial I declined to enter into an examination of that injury. These would be under the head of speculative damages, and have no place here. Courts refuse in this form of an action to inquire into and determine the question. The plaintiff had a remedy for these damages at the time. He could have paid the high rates and then recovered back the overcharge by suit, or he could by an action in this Court have compelled the defendant to extend to him the same privileges that others had. Although the overcharges may have been the legitimate cause of the failure, that branch of the subject is now

withheld from your consideration. There are three questions to be considered by you—the overcharges, the extent of the overcharges, and the amount of the overcharges.

“A verdict for the plaintiff was rendered for \$4,584.”

#### STATUTORY PROVISIONS FOR THE INTERLOCKING AND SIGNALING OF RAILROAD CROSSINGS.

In the special report to the Legislature of last winter a special consideration was made of safety methods for railroad crossings, providing for the crossing of trains without stop.

Upon the request of the Commissioner, Prof. S. W. Robinson, of the State University, made a careful investigation of a system in use in the East upon many railroads and known as the Automatic Switch and Signal System. He became satisfied of the entire safety and practicability and value of the system, and so reported.\* A proposition for legislation making conditional provision for safety appliances, in general terms, was submitted to the Legislature. After a long and careful examination of plans and descriptions of the Pennsylvania system by the Railroad Committees of the General Assembly, and by other members, the following act was passed:

#### AN ACT

To amend section 3333 of the Revised Statutes of Ohio.

**SECTION 1.** *Be it enacted by the General Assembly of the State of Ohio,* That section 3333 of the Revised Statutes of Ohio be so amended as to read as follows:

Section 3333. When the tracks of two railroads cross each other, or in any way connect at a common grade, the crossings shall be made and kept in repair, and watchmen maintained thereat, at the joint expense of the companies owning the tracks; all trains or engines passing over such tracks shall come to a full stop not nearer than two hundred feet, nor further than eight hundred feet from the crossing, and shall not cross until signaled so to do by the watchman, nor until the way is clear, and when two passenger or freight trains approach the crossing at the same time, the train on the road first built shall have precedence if the tracks are both main tracks over which all passengers and freights on the road are transported; but if only one track is such main track, and the other is a side or depot track, the train on the main track shall take precedence; and if one of the trains is a passenger train and the other a freight train, the former shall take precedence, and regular trains on time shall take precedence over trains of the same grade not on time, and engines with cars attached, not on time, shall take precedence of engines without

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\* The report of the Professor upon this Interlocking Switch and Signal Method is to be found in the latter part of this volume.



cars attached, not on time; provided, however, and in case such two railroads crossing each other, or in any way connecting at a common grade, shall by any works or fixtures to be erected by them render it safe to pass over said crossings without stopping, and such works and fixtures shall first be approved by the commissioner of railroads and telegraphs, and the plan of said works and fixtures for such crossing, designating the plan of crossing shall have been filed with such commissioner of railroads and telegraphs, then, and in that case, the provisions of said section thirty-three hundred and thirty-three, and the provisions of sections thirty-three hundred and thirty-four, thirty-three hundred and thirty-five shall not apply; but if such commissioner of railroads and telegraphs shall disapprove such plan, or fail to approve the same within twenty days from filing thereof, such companies may apply in the county where said crossing is situated, to the court of common pleas, or to a judge thereof in vacation, in the manner provided in section thirty-three hundred and seventeen, and the same proceedings shall be had, and with the same effect as provided in said last named section.

SEC. 2. Original section 3333 of the Revised Statutes of Ohio is hereby repealed.

SEC. 3. This act shall take effect and be in force from and after its passage.

O. J. HODGE,

*Speaker of the House of Representatives.*

R. G. RICHARDS,

*President of the Senate.*

#### COMPARATIVE STATEMENTS.

M. De Floville, Chief of the Bureau of the Minister of Finances of France, in a work titled "*La Transformations des Moyens de Transport et ses conséquences Economiques et sociales*," wherein he treats of the development and functions of means of communication, lays down the proposition that movement is as essential to the life of a people as to that of an animal or a plant; and that, according as the internal movement of a community is or is not highly developed, the people composing it may be considered as advanced or behind civilization. The cause of this movement accruing in society, is the necessity for exchange, both of manufactured commodities and raw produce, and the equal or greater necessity of rapid personal movement. And the need for the exchange of these arises from the great differences in the products of different parts of the globe, and in the characters of the men who dwell in them.

"This process of interchange is the basis of modern life, and just as in the animal world the degree of perfection of each species is measured by the development of the apparatus of circulation, in like manner the degree of civilization of each people may be measured by the importance, efficiency, and value of its channels and means of communication."

The author, of course, treats principally of railroads, and says:



"The principal peoples of Europe have completed their main systems, and are only occupied in increasing their ramifications."

In view of this scale of M. De Floville, the following comparative statements are made:

The United Kingdom of Great Britain had, in 1878, 17,333 miles of railway, costing \$195,536 per mile, being one mile to every 2,000 of its inhabitants.

Her movement of merchandise is about 7 tons to each one of her inhabitants.

The passenger travel is equal to each one of her inhabitants being a passenger twenty times each year.

The earnings of these railways afford a profit of  $4\frac{1}{2}$  per cent. on the investment.

France had at the same time, 13,150 miles of railway, costing \$158,752 per mile—one mile to every 2,800 of its population. The movement of merchandise was near two tons to each inhabitant. Her passenger travel equal to each one of her inhabitants being a passenger three times each year. The earnings 4 per cent. on the investment.

In the German Empire there were in the same year 18,080 miles of railway, costing \$99,220 per mile—one mile of railway to every 2,363 of her inhabitants. The movement was  $2\frac{1}{10}$  tons of merchandise to each one of the inhabitants. Her passenger travel was equal to each one of her inhabitants being a passenger five times each year. Earnings,  $4\frac{1}{3}$  per cent. on the investment.

In Ohio, at the same time, there were 4,975 miles of railway, costing \$49,440 per mile, and one mile of railway to every 641 of its inhabitants. The movement of merchandise was  $8\frac{1}{2}$  tons to each one of the inhabitants. Her passenger travel was equal to each one of her inhabitants being a passenger three times each year. Earnings,  $3\frac{1}{2}$  per cent. on investment.

It may be said that the showing would be quite different, if the view was not confined to railways. The following showings include the river ways, canal ways, and artificial roadways—graveled or macadamized—the particulars gathered from the best authorities:

The United Kingdom has of—

Railways.....	17,333 miles.
River ways.....	900 "
Canal ways .....	3,600 "
Roadways.....	127,000 "

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Total miles of communicating ways..... 148,833  
 One mile of way to each 228 inhabitants.

France had at the same time—

Railways.....	13,150 miles.
River ways.....	5,200 “
Canal ways .....	2,300 “
Roadways.....	44,000 “

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Total miles of communicating ways..... 64,650

One mile of way to every 570 of inhabitants.

In the German Empire there were—

Railways.....	18,080 miles.
River and canal ways.....	16,990 “
Roadways.....	65,200 “

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Total mileage of communicating ways ..... 100,270

One mile of way to every 426 of inhabitants.

In Ohio there were in 1878 of—

Railways.....	4,975 miles.
Canal ways.....	850 “
River ways.....	650 “
Highways (macadamized or graveled) .....	7,274 “

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Total mileage of communicating ways..... 13,749

One mile of way to every 225 of its inhabitants.

## REPORT OF THE YOUNG MEN'S CHRISTIAN ASSOCIATION.

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### THEIR WORK UPON THE RAILWAYS OF OHIO.

The Young Men's Christian Association, through their secretary, Mr. H. F. Williams, make a report of the work they have accomplished for railway men upon the railways in Ohio.

The managers of railways have, it is understood, heartily co-operated in this work, believing that the higher the moral qualities of the employes, the more trustworthy and valuable their services.

So valuable is this work, so closely associated with railroad men, and so heartily supported by the means of railroad companies, it is deemed a characteristic, in some locations, of railroad management; and their report is submitted as a proper accompaniment to other characteristics of the railroads of Ohio:

CINCINNATI, November 16, 1881.

HON. H. SABINE, *Railroad Commissioner*:

DEAR SIR: A movement under the auspices of the Young Men's Christian Association, and supported by railway corporations, which seeks specifically to benefit railroad men, has grown to such proportions and received such cordial approval by prominent officials as to merit a place in a railway report. The aim of the organization is to afford employes some suitable place where they can spend leisure hours profitably in reading, writing letters, and harmless amusements, and on Sunday have the benefit of short religious services.

It need not be stated that such rooms, suitably located, and conducted in a proper manner, must prove of incalculable benefit to railroad men generally, who would otherwise, in many cases, spend their time in saloon and gambling house, being thereby unfitted to perform their duties with that carefulness which is so necessary to the safe conduct of railroad business. The plan is to move from these hard-working employes the temptations which beset them, and in place provide them an attractive rendezvous where they can enjoy social intercourse, improve themselves by reading good books, magazines and papers, write letters, and pass the time pleasantly until called to their work.

There are in the United States sixty-two places where such organizations are in operation. The money for salaries, maintaining the rooms, etc., is contributed by lines interested, supplemented by contributions from employes. In many cases the employes necessary in conducting the work are on the pay-rolls of the roads.

One of the duties of the State Executive Committee of the Young Men's Christian Associations of Ohio is, through the State secretary, to encourage the organization and maintenance of railroad branches at important railway centers. While a number of important places are not yet organized, much has been done.

Work of the character described has been established and is in successful oper-

ation in this State at Columbus, Cleveland, Toledo, Kent and Galion. Reports of each association for the year commencing November 1, 1880, and ending November 1, 1881, are submitted:

COLUMBUS—W. A. WAGGONER, *General Secretary*.

Rooms located in Union Depot. Annual expenses, \$1,500; contributed by railway companies, \$864; contributed by employes, \$636.

*Statistical Statement.*

[The figures given in this and succeeding reports are the totals for the year].

Visitors at rooms.....	41,669
Attendance at Sunday services .....	6,957
"    cottage meetings.....	879
"    five song services .....	136
Letters written in the rooms .....	1,636
Number calls for stamps.....	2,056
Lady visitors .....	352
Papers donated for distribution.....	2,144
Number calls for papers at rooms.....	1,376
"    papers distributed in shops, cabooses, etc.....	3,460
"    volumes in library.....	1,100
"    books drawn from library.....	1,080
Visits by secretary to switch-houses, cabooses and families .....	77
"    "    sick and injured .....	184
Papers and magazines on file .....	75

A Ladies' Aid Society, composed of railroad women, is doing efficient work in visiting the sick and injured, and relieving the wants of needy railroad people. This society has provided a spring-cot, stretcher, blankets, pillow, a box containing muslin, lint bandages, and other articles necessary in case of accident. These appliances are kept in the association rooms, and have been brought into frequent use.

CLEVELAND—L. SHEAFF, *General Secretary*.

Rooms in Union Depot. Annual expenses, \$2,195. Rooms furnished and incidental expenses paid by the Union Depot Company. Two auxiliary societies, composed of ladies of railroad men's families, are doing work among sick and injured—providing socials, entertainments, etc. The association owns a chapel at Collinwood, where religious services are held.

*Statistical Statement.*

Visitors at rooms .....	28,675
Number lady visitors.....	2,538
Attendance at all Sunday services .....	11,591
"    song services .....	1,700
"    cottage meetings.....	628
Letters written at rooms.....	2,351

Number attending five socials in rooms .....	1,610
"    aided .....	64
"    visits to sick and injured by general secretary.....	143
"    of meetings held .....	212
"    signing the pledge.....	4
Papers on file.....	102
"    donated for distribution.....	6,376
"    called for at rooms .....	4,431
"    distributed in shops, cabooses, houses, etc.....	16,455
Average attendance at singing class.....	35
Volumes in library.....	600
Number times book drawn from library.....	2,279

GALION—E. S. WRIGHT, *General Secretary*.

The organization at this point has been recently formed. No detailed report has been received. The work is supported by two railway companies, and is successful.

#### KENT.

No general secretary is employed. The various agencies of the association are sustained by employes as far as is possible, without a man to give personal and undivided attention to the work.

TOLEDO—F. W. SMITH, *General Secretary*.

Rooms near Union Depot. The building is owned by the association. The material was furnished by citizens, and the building erected by the railroads—value, \$7,500. Six railway companies contribute \$1,030 annually. Amount contributed by employes last year, \$110. A full and detailed statement for the current year can not be given.

The library contains 250 volumes, and is much used.

Newspapers and periodicals on file.....	60
Daily attendance at reading-room.....	75
Visits by general secretary to sick and injured.....	150

At Dennison, Leavittsburg, Oberlin and Urbana, work among employes has been commenced by the Young Men's Christian Association or railroad men, but organizations have not been completed, or have not reported.

Respectfully submitted.

H. F. WILLIAMS,

*State Sec'y Ohio Young Men's Christian Associations.*

H. THANE MILLER, *Ch'n*,

J. N. GAMBLE, *Secretary and Treas'r*,

H. F. WILLIAMS, *State Sec'y*,

*State Executive Committee, Sixth and Elm Streets, Cincinnati.*



INSPECTION OF THE RAILWAYS OF OHIO.



## INSPECTION OF THE RAILWAYS OF OHIO.

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The 64th General Assembly appropriated seven hundred dollars for the use of the Commissioner of Railroads and Telegraphs in making an inspection of the railways and railway bridges of the State.

Messrs. R. W. McFarland, LL.D., Professor of Mathematics and Civil Engineering, S. W. Robinson, C.E., Professor of Mechanical Engineering, and Lieutenant George Ruhlen, U. S. A., Professor of Military Science and Tactics, all of the Ohio State University, were selected as experts to make the inspection. They entered upon the discharge of their duties in the latter part of June, and labored industriously until the latter part of September.

The Lake Shore and Michigan Southern Railway was first examined by all of the inspectors together; afterward each one took up his investigation upon the railways assigned him by mutual agreement.

The special reports concerning faults have been made to the Commissioner immediately upon the finding. These reports have not been given to the public at any time, except those upon the Cleveland, Mt. Vernon and Delaware Railroad. The examination of this road was made upon complaint, and before the inspectors entered regularly upon their work. It was thought that the publicity of special findings might occasion undue alarm, and perhaps work undue injury to the road.

Immediately upon the receipt of a report condemning a bridge, or part of bridge, or trestle, a copy of the same was transmitted to one of the principal officers of the railway, and, with only two exceptions, there has been invariably an early, kind and courteous response from the proper officer in the management, giving assurances of a prompt repair.

There are on file in the office copies of all communications made to railway officers, copies of the special reports of the inspectors sent therewith, the letters of assurances that repairs would be made received in return, and also the subsequent reports from the same officers that such repairs had been made. These are not published, but are open to the examination of any one who may desire to look into the special findings of the inspectors.

Examination of all the bridges in Ohio, with the exception of ten, were made, and measurements of all were taken. These measurements

are in the office. Estimates of strength have, in many instances, been made, especially when the qualities of the bridges suggested such an estimate that their condition might be known.

The inspectors were offered every facility by the railroad officers that could have been desired. In most instances, a "special" was sent out exclusively for the work, and the inspectors were generally accompanied by the general manager or superintendent, division superintendents, road masters, and bridge master. They all seemed to recognize the right and propriety of an examination, on the part of the State, into the condition of the railways over which millions of people trust themselves to be carried without any specific knowledge as to the safety of their ways.

The management of railways is like that of private affairs. In some instances it is most excellent, and again it is exceedingly neglectful. It was the purpose of the State in providing for this work, to secure those who travel over Ohio railways from injuries and loss of life, arising from the neglects of the latter.

That a careful examination has been made, and a just and intelligent judgment rendered, no one will doubt who is acquainted with the high character and thorough acquirements of the gentlemen who were selected for the task.

Upon beginning the work of inspection, the Commissioner gave them the following letter, suggesting the purpose of their appointment, and the desired scope of their observations.

The appropriation was so meagre that but a limited field of observation was attempted.

Hereinafter will be found the general reports made by the inspectors.

#### LETTER OF INSTRUCTIONS.

OFFICE OF COMMISSIONER OF RAILROADS AND TELEGRAPHS,  
COLUMBUS, OHIO, June 23, 1881.

To MESSRS. R. W. MCFARLAND, S. W. ROBINSON, GEORGE RUHLEN, *Civil Engineers and Inspectors of Railroads of Ohio*:

It is desired by the Commissioner on the part of the State to secure a careful inspection of the railroads of Ohio, more particularly as to their means for the safe transportation of passengers over their ways.

It is also desired that all bridges shall be analytically examined, measures taken for the estimates of their strength; examinations made as to the soundness and quality of the timber used; the guarantees secured concerning the strength of the iron used should be ascertained; and, in general terms, a complete history of each bridge should be obtained.

You will, if you please, make observations of all the characteristics, good or bad, that may distinguish any road in its management as a railway.

In case of serious fault in construction or condition of any road, or part of road that indicates the same to be unsafe or dangerous for the transportation of passengers, a special report should be made at once to the Commissioner, in which you will state specifically the points at fault, and the means necessary in your opinion for the repair of the same.

A report concerning each road that you may be able to inspect is desired, in which it is expected you will approve or condemn, as your observation and judgment may determine.

Very respectfully,

H. SABINE,

*Commissioner of Railroads and Telegraphs.*

# REPORT OF R. W. McFARLAND, LL.D., CHIEF OF INSPECTORS.

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## GENERAL OUTLINE.

### I. PITTSBURGH, CINCINNATI AND ST. LOUIS RAILWAY.

1. "Pan Handle," from Columbus to Steubenville.
2. Cincinnati and Muskingum Valley, from Dresden to Morrow.
3. Little Miami, from Morrow to Cincinnati.
4. Little Miami, from Morrow to Xenia.
5. Columbus and Xenia, from Xenia to Columbus.
6. Little Miami, from Xenia to Springfield.
7. Little Miami, from Xenia to Dayton.
8. Dayton and Western, from Dayton to New Paris.
9. C., C. & I. C., from Richmond, through Greenville to Columbus.

### II. MARIETTA AND CINCINNATI RAILROAD.

1. Main Line, from Hamden eastward to Parkersburg.
2. Short Branch to Marietta.
3. Portsmouth Branch, from Portsmouth to Hamden.
4. Main Line, from Hamden westward to Blanchester.
5. Hillsboro Branch, from Blanchester to Hillsboro.
6. Main Line, from Blanchester westward.

### III. CINCINNATI, HAMILTON AND DAYTON RAILROAD.

1. Main Line, from Cincinnati to Hamilton.
2. Cincinnati, Hamilton and Indianapolis, from Hamilton to Oxford.
3. Cincinnati, Richmond and Chicago, from Hamilton to Richmond.
4. Main Line, from Hamilton to Dayton.
5. Dayton and Michigan, from Dayton to Toledo.

### IV. TOLEDO, DELPHOS AND BURLINGTON RAILROAD.

1. Main Line, from Toledo via Delphos to Wellshire.
2. Main Line, from Delphos via Spenceville and Mercer to Dayton.
3. Southeastern Division, from Dayton to Chillicothe.
4. Southeastern Division, from Wellston to Chillicothe.
5. Southeastern Division, Allentown Branch, from Allentown westward to New Burlington.

### V. SCIOTO VALLEY RAILWAY.

1. Bridges from Columbus to Chillicothe.
2. Trestles from Columbus to Chillicothe.
3. Main Line, from Chillicothe to Portsmouth.
4. Branch, from Portsmouth via Sciotoville to Ice Grove.

### VI. SPRINGFIELD SOUTHERN (OHIO SOUTHERN) RAILWAY.

1. From Greenfield to South Charleston.
2. From Greenfield to Jackson.

## VII. CLEVELAND, COLUMBUS, CINCINNATI AND INDIANAPOLIS RAILWAY.

"Short Line Division," Cincinnati and Springfield Railroad, from Dayton to Cincinnati.

## VIII. CINCINNATI AND WESTWOOD RAILROAD.

## IX. COLLEGE HILL RAILROAD.

## X. CINCINNATI NORTHERN RAILWAY.

## XI. CINCINNATI AND EASTERN RAILROAD, AND COLUMBUS AND MAYSVILLE RAILWAY.

1. Walnut Hills Branch.
2. Main Line to Richmond.
3. Richmond Branch, from Richmond to New Richmond.
4. Main Line, from Richmond to Sardinia.
5. Main Line, from east of Winchester to Sardinia.
6. Columbus and Maysville, from Sardinia to Hillsboro.

## XII. CINCINNATI, GEORGETOWN AND PORTSMOUTH RAILROAD, from Cincinnati eastward.

## XIII. OHIO AND MISSISSIPPI RAILWAY, from Cincinnati westward.

## XIV. CINCINNATI, INDIANAPOLIS, ST. LOUIS AND CHICAGO RAILWAY, from Cincinnati to Harrison and Lawrenceburg.

## XV. LOUISVILLE SHORT LINE. Bridge at Cincinnati.

## XVI. CINCINNATI SOUTHERN RAILWAY. Bridge at Cincinnati.

## XVII. Note on Scioto Valley bridge at Chillicothe.

## XVIII. BALTIMORE AND OHIO RAILROAD. Trestle at Parkersburg.

## XIX. DAYTON AND UNION, from Dayton westward.

These roads will be considered in order:

## I. PITTSBURGH, CINCINNATI AND ST. LOUIS RAILWAY.

## 1. "Pan Handle," from Columbus to Steubenville.

a. *The track*.—On the whole, this is in good condition; the ballast is in sufficient quantity, the alignment of the rails is good, and the surfacing is also good; the portion of the road between Columbus and Newark is not so satisfactory as the remaining portion—a state of facts arising from want of perfect agreement between the parties using the bed of road as to the extent to which each of the said parties should be charged with repairs.

b. *Fencing*.—The track is enclosed for almost the whole distance by fences belonging to the road owners.

c. *Ditches*.—Good and well cared for.

d. *Bridges and culverts*.

These are here referred to sometimes by their location, and sometimes by number, as seems most convenient.

Alum creek,  
3 miles from  
Columbus.

The Alum creek bridge—Two spans; Howe-deck. The west span has six panels, each  $8\frac{1}{2}$  feet; height, 11 feet; breadth, 10 feet. Main braces, double, and 8 inches by 6; counters, 7 inches by 6. Lower chord, in four pieces,  $4\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $4\frac{1}{2}$  inches wide, and 11 inches deep.

Upper chord, the same, except the depth is 10 inches. The east span has 11 panels, similar in all respects to the west span, except the timbers are heavier. Main braces, double, and 7 by 10 inches; the counters, 7 by 7 inches. The rods are double in both spans, and vary from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. Lower chord, four pieces, 6 by 13 inches deep; upper chords, 11 inches deep. Sway braces, 7 by 7 inches. Tie rods, lateral,  $1\frac{1}{2}$  inches. Age not ascertained. In good condition.

This bridge consists of three span-deck Howe Truss—old, and marked for speedy renewal. Each span is supported in the center by a frame bent beneath the chord. Without these frame bents the bridge would be dangerous. In view of the preceding statements, the dimensions of the timbers are not given here.

Walnut creek, say 8 miles from Columbus.

Howe-deck, 11 panels, each  $8\frac{1}{2}$  feet—in essentials the same as the Alum creek bridge, except it seems older and less strong, but is marked for speedy renewal.

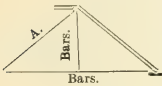
Black Lick, say 2 miles further from Columbus.

This is an iron structure, built by the Keystone Company. It consists of eight panels, each 12 feet; is 14 feet broad in the clear, and  $21\frac{1}{2}$  feet high. The masonry is first-class. The floor is very close, only 2 inches open spaces; the ribbons, or outer wooden guard rails, are 8 by 5 inches, and are well bolted. The lower lateral tie rods are one inch in diameter.

Canal bridge, 1 mile west of Newark.

The floor beams are double iron I beams, 14 inches deep by  $\frac{1}{2}$  inch thick, and  $4\frac{1}{2}$  inch flanges. The track-stringers are double, 6 $\frac{1}{2}$  by 15 inches. The lower chord in the center consists of four bars,  $2\frac{1}{2}$  inches deep by  $1\frac{1}{2}$  inches thick; the adjoining panel has four bars, 2 by  $1\frac{3}{8}$  inches, and the double panel at the end has four bars,  $1\frac{1}{2}$  inches square,

and the suspension bars in the same panel are double, and  $1\frac{1}{2}$  inches square. The phoenix columns at the middle of the bridge, and the joints on each side of the center are 8 by 4 inches; the column farthest from the middle is a similar column, 10 by 6 inches, *i. e.*, the plates are 6 inches plates, but so arranged as to make



a diameter of 10 inches. In this style of bridge the weight of the structure and the load are carried to the abutments by the sloping bars which run from the center upwards toward the end of the bridge, as at A in the figure. The center bars are double, and are  $1\frac{1}{2}$  inches square; the next,  $1\frac{3}{4}$  inches; the outer ones,  $2\frac{1}{2}$  inches square; the pins are  $2\frac{1}{2}$  inches diameter. The struts at the ends are made of two channel bars, 8 by  $\frac{1}{2}$  inches, riveted to a plate  $13\frac{1}{2}$  inches wide and  $\frac{1}{4}$  inch thick. The top chord is similar to the end struts.

These minutiae are here given because this structure is the lightest one on the Pan Handle roads. The bridge quivers under a passing train more than any other iron structure which came under my notice. Two passenger and one freight train passed while the bridge was under examination, and especial care was had to see the behavior of the structure when greatly strained. Some of the freight engineers are apprehensive of danger. Yet, supposing the total load on a panel to be 40 tons, which is a very liberal allowance, no bar is strained to exceed 8000 pounds to the square inch, while 10,000 pounds are always deemed a fair allowance for good iron. The conclusion seems therefore unavoidable that the bridge is safe, except in case of derailment of car or of lo-

comotive. However, I was informed that it is the intention of the company to rebuild shortly.

Raccoon  
creek at New-  
ark.

This is also a Keystone iron structure, built in 1878. It has six panels, and is 102 feet long, 14 feet broad,  $21\frac{1}{2}$  feet high. The masonry is excellent, the floor and ribbons as in the preceding bridge. The track stringers are 18-inch plate iron,  $\frac{5}{16}$  inch thick, and strengthened by 4 angle irons, 4 by 6 inches, and  $\frac{1}{2}$  inch thick, running the whole length. The bridge is very strong. For particulars I refer to the sketch-books used in the examination of the railroads—the one marked 3, pages 21 and 22.

Small bridges.

There are also between Columbus and Newark six or eight short bridges, say the spans not exceeding 30 feet, some plate and some trussed girders; all safe.

No. 73, at  
Newark.

Over the north fork of Licking river. This is a wooden Howe truss; total length, 150 feet; 14 feet wide, and 20 feet high. It is strengthened by double arches on each side; but is rather old, and has been marked for renewal shortly. Particulars will be found at page 37, book No. 2.

No. 72, over  
canal.

Plate girder, 72 feet long, 14 feet wide, and 6 feet deep. There are 4 gussets on each side, and stiffening bars at intervals of 4 feet. In the notes of book No. 2, the statement for this bridge is—"very strong."

No. 71—stone.

This consists of three stone arches of 16 feet radius, and well secured in every way.

No. 70—canal.

This is a skew Howe Truss; 12 panels, of  $10\frac{3}{4}$  feet each—total length, 130 feet; old, and condemned by the engineer in charge, and will shortly be replaced.

No. 69—stone.

Three stone arches, as No. 71; very good.

No. 68—Wa-  
katonica.

Old Howe Truss, like No. 70; condemned, temporarily strengthened, and to be immediately rebuilt.

No. 67—canal.

In process of replacement by plate girders; two spans, 35 and 69 feet.

No. 66—Mus-  
kingum river.

Three spans; panels,  $10\frac{1}{2}$  feet, and 14 in number in each span. One side is approached by a trestle, 150 feet long, on piles, at intervals of 16 feet. The floor, ties, track-stringers, etc., the same over bridges and trestle. The bridge is 14 feet wide in the clear, and 21 feet high; built in 1877. The center counter braces are 9 by 9 inches; the center main braces are 6 by 12 inches; and at the end 10 by 13 inches. The chords are 34 by 16 inches. Rods from 2 to  $1\frac{1}{2}$  inches, and in number from 3 to 5, as necessity requires. All very good.

No. 65—New-  
comerstown.

Iron bridge, two years old. Three spans, 11 panels each; 150 feet, and 30 feet high, with usual width. This bridge was built with great care, having had every piece tested at the works. It was considered superfluous to take measurements.

No. 64.

Same as 65; just finished (July 21, 1881). The method of suspending the floor beams is new, and seems the best of all processes. Instead of stirrups at the foot of the posts, plates are riveted directly to the vertical posts, and makes the structure exceedingly stiff.

No. 63—  
Uhrichsville.

Four stone arches, of 30 feet each, on pile foundations, well protected, and all very substantial.

No. 62—3 miles  
from 63.

Three stone arches in all respects like No. 63.

No. 61.

Two stone arches, built wide for double track, and like the preceding.

No. 60.

Two stone arches, like the preceding; one year old.



- 1,250 feet long; west end protected by timber, the east end is arched Tunnel.  
with brick; in good condition.
- Two stone arches, of 33 feet each, and very good. No. 59—Con-  
norton creek.
- Single 7 center stone arch, 14 years old. 62 feet span; the crown  
settled about 4 inches on striking the center, but no stone was broken. No. 58.
- The appearance is bad, but there is no apparent diminution of strength.
- Two full center new arches on a curve of large radius. No. 57.
- Howe Truss, 6 panels; total length, 72 feet. Very strong. No. 56.
- Plate girder, 36 feet long; plates,  $3\frac{1}{2}$  feet; built and strengthened in  
the usual way. No. 55.
- Same in all respects as 55. No. 54.
- Half Howe Truss, 36 feet long. Chords solid, 8 by 12 inches. No. 53.
- Same as No. 55. No. 52.
- A brick arched tunnel, 1,250 feet long; in good condition. At 124 miles  
from Colum-  
bus.
- A 20 feet span I beam, and strong. No. 51.
- A Howe Truss of  $7\frac{1}{2}$  panels,  $10\frac{1}{2}$  feet each. Smallest timber 6 by 8  
inches; largest, 7 by 12 inches. Chords, 28 by 14 inches. Rods, from  $1\frac{5}{8}$   
to 2 inches. Road beams, 8 by 14 inches, and five to a panel. Bridge  
good. No. 50.
- Howe Truss of 8 panels, each  $10\frac{3}{4}$  feet; in essential respects like No. 49.  
No. 50 above described.
- Two stone arches of 30 feet span—full center. Fifteen years old. No. 48.
- Good.
- Three stone arches of similar build, and 29 or 30 years old. There No. 47.
- is a little injury to the ice-breaks, but not such as to injure the work.
- This is like No. 47, but is 33 feet in span, and is old. No. 46.
- Like 46 in all respects. No. 45.
- Three spans, of 30 feet each, two years old. It stands near the east No. 44.
- end of a tunnel, 900 feet long, through solid rock. At the east end of  
the tunnel, the entrance, there are a few wooden bents to protect per-  
sons and property from the rock which is to some extent disintegrated.
- This is for double track; is of the accustomed span; twelve years No. 43.
- old, and is very strong.
- Three usual spans, and old but good. No. 42.
- There is a tunnel 1,200 feet long, a companion piece of the tunnel Tunnel, 132  
near bridge 44. miles from  
Columbus.
- Two arches, stone, 11 years old, and similar to the other stone No. 41.
- structures on this road.
- Three arches, all good. No. 40.
- An iron Keystone bridge of 9 panels; total length, 129 feet; height, No. 39.
- $21\frac{1}{2}$  feet, center to center, 15 feet wide, center to center; 9 panels, 14 feet,  
except the double end panels; first panel, lower chord, 2 bars, 4 by  $\frac{3}{4}$   
inches; second, 2 bars, 4 by  $1\frac{1}{4}$  inches; third, 4 bars, 4 by 1 inches;  
fourth, 4 bars, average  $1\frac{1}{4}$  inches, 4 inches deep; fifth, a little stronger;  
pins,  $3\frac{3}{4}$  inches; upper chord, 2 channel bars, 12 inches; 1 plate, 17 by  
 $3\frac{1}{2}$  inches, thickness varying in the different panels; upper pins, 3 inches.  
The web members of proper dimensions. Bridge first quality.
- Three stone arches, each 33 feet; very good. This structure is about No. 38.
- 25 years old.
- Then follows an arched tunnel, 500 feet long. Tunnel.
- Three stone arches, same dimensions as No. 38. No. 37.

No. 36. Is an iron Keystone of 9 spans; total length, 144 feet, and is in essential particulars like No. 39 above (which see); 136½ miles from Columbus. Dimensions as in No. 39 above.

No. 35. Two spans, Howe Truss, each of 9 panels, 10 feet long. This bridge is on a curve, and will be abandoned as soon as the adjoining tunnel is finished. The approach to the tunnel does not cross the bridge. Particular specifications are in general note book No. 2, pages 46 and 47.

No. 34. Same as No. 35, except that it is 72 feet long. It will be used only a short time.

No. 33. Iron, 11 panels; 150 feet total length; height, 28 feet. The track-stringers are double iron beams. The whole structure is excellent.

No. 32. Four miles from Steubenville. Howe Truss, 150 feet long, 14 panels, of usual height and width. End main braces are 10 by 12 inches; the rods are by fives; of these the center rods are all 1½ inches; at the end three of the rods are 2¼ inches, and two 1½ inches. There are four arches, consisting of three pieces each, of a width of 8 inches, and depth of 10½ inches. The bridge is entirely secure.

## 2. Cincinnati and Muskingum Valley, from Dresden by way of Zanesville to Morrow.

Canal. South of Dresden, in a bridge over the canal; it is old, supported by a frame bent, and will be immediately renewed—the timber being on the ground at the time of the examination, July 22, 1881.

Trestle. Immediately adjoining the bridge is a trestle varying in height from 10 to 20 feet, and is 800 or 900 feet long. The company is filling up the trestle way to the depth of 6 or 8 feet, thus making the structure very firm and rigid.

Wapatomica. Iron lattice—triangular arrangement. Two spans, just completed; very substantial. Stone pier and stone abutments good.

Muskingum. This bridge has a trestle approach of 18 bents, 25 feet apart, and braced for half the length with horizontal timbers. The bridge consists of 4 spans, deck Howe Truss, each 140 feet long. The two at the northern side are new, and timber is on the ground for immediately renewing the other spans. In the trestle work at the south side, there are 16 bents, 25 feet apart, and about 25 feet high, and moderately well braced; also, there are 20 bents of less height with cross bracing; but the trestle work is being gradually reduced in extent by filling in with earth from the outer end toward the river. On the south trestle the ties are 6 by 8 inches, and they are 10 inches apart. On the north trestle, they are 3 by 10 inches, and are two feet or more apart. The guard rail on the trestle is of very little force, and the distance between the ties would cause a very bad wreck in case of derailment of cars. The ribbons and ties on the bridge proper are very good.

No. 44. Bridge at Zanesville. This consists of 4 Howe Trusses, 138, 153, 146½, and 155 feet, respectively, 14 feet broad in the clear, and 22 feet high. The main braces are by threes, and the counters by twos. The rods are by threes, the largest size, 2½ inches; the smallest, 1¾ inches. Upper chord is 32 by 13 inches; the lower, 32 by 15 inches, and covered. The age of the parts of the bridge varies from 2 to 4 years.

Canal (43½). There is a short stone arch, and a swing bridge, having I beams, 25 feet long. All good.

Howe Truss, 163 feet long, 14 panels, usual height and width. There are 4 arches, each 10 by 12 inches. The ties are 3 by 10 inches, and 2 feet apart. The timbers vary from 8 by 8 to 8 by 10 inches. The bridge is not strong, and needs the careful attention of the road master. Jonathan's creek, 43.

Howe Truss over the same creek; 132 feet long, usual height and width. The lower chord consists of two pieces, 5 inches broad, and two, 7 inches; all 14 inches deep. The road beams are 7 by 13 inches; the track-stringers, 12 by 12 inches; the ties are 7 by 8 inches. The ribbons are good. The rods are by 4's, from  $1\frac{1}{2}$  to  $1\frac{5}{8}$  inches. Bridge only medium. No. 42.

Howe Truss, 110 feet long, 9 panels; very like No. 42. No. 41.

Howe Truss, same size as No. 41. The timbers vary from 7 by 9 to 7 by 8 inches. The rods are double, and vary from  $1\frac{1}{4}$  to  $1\frac{5}{8}$  inches. The chords are the same as in No. 42. There are 4 arches, each consisting of two pieces, 8 by 11 inches. Road beams, 7 by 13 inches. The ties are 7 by 8 inches, and 8 inches apart, making a good floor. All the road beams are suspended by rods or stirrups. The bridge was built in 1860, was formerly covered, but that was removed when the ribs were put in. The lateral bracing in all these bridges is of the usual form and dimensions. No. 40.

Over same creek (Jonathan's); Howe Truss, 10 panels; total length, 122 feet; in all respects like No. 40, and is of the same age. No. 39.

Howe Truss, 10 panels; total length, 122 feet; same as No. 39. The chord at the fourth joint from the end was burnt partly off, but is suspended to the arch by 4 rods,  $1\frac{3}{8}$  inches diameter. No. 38.

Covered Howe Truss, 11 years old, 11 panels; total, 132 feet. Timbers vary from 8 by 8 to 9 by 10 inches. For three panels from the end the rods are by threes; the remainder by twos; in other respects the structure is like those above, built by the same men, and on the same plan, and is a medium structure only. No. 37.

New Howe Truss, not quite finished (July 22, 1881). There are 10 panels, each  $12\frac{1}{2}$  feet long. Road beams, 7 by 14 inches, and 5 inches a panel; the end main braces are 12 by 12 inches; others are smaller, down to 9 by 12 inches. The counters are from 6 by 9 to 8 by 9 inches. The three middle panels have each two rods, the remainder, three, varying in all from  $1\frac{1}{2}$  to 2 inches. Roadway or floor as before. The track-stringers are 5 by 12 inches, and double. Ribbons are notched and full bolted. Bridge 14 feet wide, and  $21\frac{1}{2}$  feet high. Very good. No. 36.



Deck Howe Truss, covered and weather-boarded, built in 1861; two spans each  $148\frac{1}{2}$  feet. The chords consist of 4 pieces—two of them 5, and two 6 inches wide, all 13 inches deep. The main braces vary from  $7\frac{1}{2}$  by 9 to  $7\frac{1}{2}$  by 10 inches. The counters are  $7\frac{1}{2}$  by  $7\frac{1}{2}$  inches; sway braces, 6 by  $7\frac{1}{2}$  inches; lateral bracing as usual; tie rods,  $1\frac{1}{2}$  inches. The rods are by 3's, and vary from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. No. 35.

Each span is supported the third joint from each end by double supports or yokes, as here indicated. The bridge is old, light, weak, and needs renewal. It is about 50 feet above the bed of the stream. The guard rails are well bolted, as they should be.

- Tunnel,           Next there is a rock tunnel, 1,185 feet long, in good condition.
- No. 34.           Covered,  $\frac{1}{2}$  Howe Truss, one mile west of Lexington. Eight panels, each 8 feet and  $7\frac{1}{2}$  feet high. Timbers are from 5 by 6 to 6 by 8 inches. The bridge is to be strengthened by extra rods at the ends. Bridge seems good.
- No. 33.           Covered Howe Truss, 90 feet long; 8 panels, each 10 feet; usual height and breadth; good floor; timbers, from 6 by 7 to 7 by 9 inches. Road beams, 7 by 13 inches, and four to a panel; rods, from  $1\frac{1}{2}$  to  $1\frac{1}{2}$  inches, and appear in couples. Chords, 4 pieces, two 5, two 6 inches wide, and all 13 inches deep. The bridge is sufficiently strong.
- Trestles.       Then follow seven trestles, varying in height from 6 to 8 feet, and in length from 40 to 100 feet. There are good guard rails on all of these structures.
- No. 26.           Three spans, half truss, Howe; six foot panels, whole length, 189 feet, with continuous chord; pile piers to be replaced by stone. Timbers, 5 by 6 to 6 by 7 inches. Rods,  $1\frac{1}{4}$  to  $1\frac{5}{8}$  inches; and occur by twos. Five years old; seems sufficiently strong.
- No. 25 $\frac{1}{2}$ .       Two spans, of 60 feet each, in all respects like No. 26. At the west side is a frame trestle, 60 feet long, in good condition.
- Trestles.       Then follow three short frame trestles, 8 or 10 feet high, and needing no further mention.
- No. 25.           Half truss, Howe; like No. 26 in all essential points.
- No. 24.           Same as 25; six months old.
- No. 23.           Iron bridge. Kellogg & Maurice pattern.
- No. 22.           Howe Truss; usual height and breadth, and size of iron and timbers—the dimensions of which are given in the original notes.
- No. 21 $\frac{3}{4}$ .       Half Howe Truss, 48 feet long, having solid chords, and usual weight of timbers.
- No. 21 $\frac{1}{4}$ .       Same as the preceding, except it is a deck bridge.
- No. 21.           Low Howe Truss, 62 feet long; is old, has been lately repaired to some extent, but needs more. Like the preceding.
- No. 20.           Bridge over the Scioto at Circleville. In preliminary report marked "A," all the points necessary to give will be found. It is added here that on a subsequent visit I found that the timber for the new structure was partly delivered.
- No. 19.           Canal bridge, old and bad, to be replaced immediately; timber already on hand for the purpose.
- Trestles.       Then follow three trestles of 60 feet span; total, in four bents; good, and needs no further mention.
- No. 18.           Deer creek; two spans, covered deck. Each span is supported at the  $\frac{1}{4}$  points by framed yokes or supports, which are ballasted with heavy rock. The structure is 16 years old, and should be rebuilt at once. Each span is 160 feet long, and has 14 panels, with timbers lighter than is or should be now used, considering the increased weight of locomotives and freight cars. The east approach is 77 feet long, and should be replaced. The west approach is 40 feet, and is also bad; but the proper officer assured me that it would soon be renewed.
- No. 17 $\frac{1}{4}$ .       Half Howe Truss; two spans, each 60 feet. Nine panels; stone pier but pile abutments. The chord is triple,  $4\frac{1}{2}$ , 9,  $4\frac{1}{2}$  by 13 inches deep; road beams, 8 by 14 inches; rods, from  $1\frac{3}{8}$  to  $1\frac{1}{2}$  inches. All in good condition, except that the ties are too far apart, and the wooden guard rails are too small and too weak.

- A pile trestle, about 60 feet long, with bents 15 feet apart; good. Trestle.  
 Over Paint creek, at Washington C. H.; 180 feet long; is old and Trestle.  
 bad; but new timber is already on hand for a new structure (July 22).  
 A low, safe trestle, 121 feet long. Seven miles from Washington Sugar creek.  
 C. H.  
 A trestle, 151 feet long, and about 8 feet high, and very good. Rattlesnake.  
 A similar trestle 100 feet long. Anderson's  
 Fork.  
 Near this town is a similar trestle about 80 feet long, also a half Wilmington.  
 Howe truss, 57 feet long, with solid chords like 21½ above-named. Fur-  
 ther statement not required.  
 A low Howe Truss of 10 panels, 7¾ feet each: total length, 81 feet; No. 17.  
 height of truss, 12 feet; will shortly be rebuilt.  
 Half Howe Truss, 57 feet long, of usual sized timbers, but the rib- No. 16.  
 bons are small and of small use.  
 These are all counterparts of No. 16. Nos. 15, 14, 13.  
 This bridge is the same in all respects as No. 17 above. No. 12.  
 Howe Truss, of 7 panels each, 10½ feet; total length, 81 feet; will No. 11.  
 shortly be rebuilt.  
 Howe Truss, 8 years old, decayed in places; 10 panels; total length, No. 10.  
 120 feet. Quadruple chords, two pieces 6, two 7 inches; all 14 inches  
 deep. Road beams are 8 by 13 inches; track-stringers, 12 by 14 inches;  
 rods, from 1½ to 2 inches, and braces range from 8 by 8 to 7 by 11 inches.  
 Three spans, 65 feet each; of these, one is 11 years old; the other two,  
 20 years, and fairly well preserved. The piers are slightly injured. Floor No. 9.  
 new.  
 Two spans, counterpart of No. 9. Stone piers; timbers of usual No. 8.  
 size. Piers and abutments good; floor new.  
 Half Howe Truss, 6 years old, 77 feet long, and like others of this No. 7.  
 class.  
 Howe deck bridge, and covered; two spans, each 80 feet, with tim- No. 6.  
 bers of the usual size, given on page 64, book No. 2. The pier is good,  
 but the abutments, made of blue limestone rock, are disintegrating.  
 There is a small approach at each end.  
 Howe-deck, 14 years old; two spans, each 97½ feet, and similar in No. 5.  
 essential features to No. 6.  
 These are like No. 6, and are 11 years old. Nos. 4 and 3.  
 Two spans, one 81 feet long, 12 years old; the other 106 feet long, and No. 2.  
 9 years old. The timbers of the longer span are larger than those of the  
 shorter span. These bridges are all on the same general plan.  
 Two spans, 12 panels each, 11¾ feet; total length of each span, 145 No. 1, Morrow.  
 feet; breadth, 14 feet; and height, 22½ feet. Chords, 30 by 14 inches.  
 Road beams, 8 by 14 inches. Lower lateral braces are 6 by 8 inches; the  
 upper, 6 by 6 inches. The center counter-braces are 9 by 10 inches; the  
 center mains, 7 by 9 inches. The rods vary from 1¾ to 2½ inches. The  
 west span is just completed; the other is in process of erection.  
 At each end of the bridge is a trussed girder 30 feet long.  
 The ballast on this branch of the line is moderately good; the road- Ballast.  
 way is in a passably fair condition, and the ditches and fencing "fair to  
 middling." All the branch lines which I have examined, show a less  
 degree of completeness than the main lines, and the reason is not far to  
 seek.

## 3. Little Miami, from Morrow to Cincinnati.

At Morrow,  
No. 14.

Two spans, 110 and 100 feet respectively; usual height and breadth; between 2 and 3 years old.

End main braces, 9 by 12 inches; end counters, 6 by 8 inches. Chords, 30 by 14 inches. Lower lateral braces and tie-rods as usual. Road beams, 8 by 14 inches, and 5 to a panel; rods, from  $1\frac{1}{4}$  to  $1\frac{3}{4}$  inches; middle mains, 7 by 10 inches; middle counters, 8 by 10 inches. Track stringers, 6 by 12 inches double, and re-enforced by like beams, bearing up the ends of the ties, and all notched down on road beams. The ribbons are bolted.

Trussed gir-  
der.

The next is a double-track trussed girder, 48 feet long, and strong enough.

O'Bannar cr'k,  
Loveland.

One-half Howe Truss; two spans, each 65 feet; 12 panels, 5 feet each. End mains, 9 by 12 inches; end counters, 6 by 8 inches; middle mains, 7 by 12 inches; middle counters, 9 by 10 inches; rods, from  $1\frac{1}{4}$  to  $1\frac{3}{4}$  inches. There are four road beams to a panel, set close together and treated as a trussed girder. New flooring is needed.

Miamiville,  
deck.

Two spans, 120 feet each, of 14 panels  $8\frac{1}{2}$  feet each; one span 60 feet, and two stone arches; at the south end a little battered by ice and drift-wood. The spans have been built 16 years; sufficiently strong. Particulars for timbers can be found on page 68, book 2, before named.

No. 6, Milford.

Double track, low Howe; 36 feet long; 6 panels. Seems good.

No. 2.

Double track, 24 feet broad, 50 feet long; same as bridge at Loveland.

No. 22, Cesar's  
creek.

Two spans, iron; one, 12 panels, the other, 10, of  $6\frac{3}{4}$  feet clear height. The upper chord consists of two channel bars, 8 inches deep; flanges, 2 inches; thickness,  $\frac{1}{2}$  inch, and a plate 1 foot wide, and  $\frac{1}{4}$  inch thick. There is one plate on the first panel, two on the next two panels, same thickness; on the next three panels, the upper plate is  $\frac{3}{8}$  inch.

The columns are of the kind called "Phoenix," and vary in size from 4 inch sides to 6 inch, and from 7 to 9 inches diameter. The pins are 2 inches. The trusses are braced at alternate joints with T iron bars, 5 feet long,  $2\frac{1}{2}$  inches broad, and  $\frac{3}{4}$  inch thick. Diagonal tie-rods,  $1\frac{1}{2}$  inches.

The cross-connecting beams are double channel bars, 5 deep flanges, 2 inches, and of  $\frac{3}{8}$  inches thickness, connecting at alternate posts. The floor beams are I beams, 10 inches deep; flanges, 4 inches; thickness,  $\frac{5}{8}$  inch. The floor itself consists of ties 4 by 10 inches, at intervals of 10 inches. The track stringers are double, oak 6 by  $9\frac{1}{2}$  inches. Ribbons, 4 by  $4\frac{1}{2}$ , full bolted. The links of the lower chord, or bars, are in the two end panels of the long span, four in number, 6 inches deep, and  $\frac{1}{2}$  inch thick. In the 3d and 4th panels, the bars are of the same depth, but two of them are  $\frac{3}{4}$  inch; to the 5th and 6th panels, 2 bars are 6 inches deep and  $\frac{3}{4}$  inch thick, and 2 same depth and  $\frac{7}{8}$  inch thick. The suspension inclined bars in the panels vary from  $1\frac{1}{2}$  inch in the center, to 2 inches square at the end; these are in pairs; the counters are single, and vary from  $1\frac{1}{2}$  inch in the center to  $\frac{7}{8}$  inch in the end panel.

The masonry is first class, and of such a height as to set the bridge about 12 feet above low-water mark. The work is all of the very best quality.

## 4. Little Miami, from Morrow to Xenia.



Between Morrow and Xenia are many short spans, from 15 to 40 feet, and all are either plate girders or I beams, and are all very firm and secure, and are usually from 3 to 5 feet high. The first one north of Cesar's creek bridge is 17 feet long. The plate is 2 feet deep, and  $\frac{3}{8}$  inch thick, and is re-enforced by double angle irons at top and bottom  $\frac{3}{8}$  inch thick, and having one branch 3 inches, the other 4 inches wide. The floors are ties 8 by 6 inches at intervals of 8 inches; the ribbons are 8 by 6 inches, well bolted. No better short spans can be found. The track itself from Cincinnati to Columbus is in excellent condition—parts of it as good as can be made. The fencing and ditches are also as they should be. Small spans.

Two span; double span; iron plate girder over the street; three tracks and 4 trusses, the outer ones being 12 inches, the inner ones 16 inches in width of plate. The plates of the sides are 3½ feet deep, and are  $\frac{3}{8}$  inch at the ends, and  $\frac{5}{8}$  inch in the middle. Near depot in Xenia.  
The center supports are wrought iron columns.

##### 5. Little Miami, from Xenia to Columbus.

From Xenia to West Jefferson there are some short spans for roads or cattle passes, but nothing requiring attention. They are all strong and durable; the abutments are in all cases stone, of good construction. Little Darby, ½ mile east of West Jefferson

Howe Truss of 12 panels, each 10½ feet; breadth, 14 feet in the clear; and height 20 feet clear. The masonry is good, but shows the natural disintegration which is apt to befall the Helderberg limestone. The lower chord has 4 pieces, of which two are 5 and two are 6 inches wide, and all thirteen inches deep.

The floor beams are 7 by 14 inches, and are four to each panel; the main braces vary from 7 by 9 inches at the center, to 8 by 10 inches at the ends; the counters, from 6 by 6 to 7 by 8 inches; the suspension rods are by threes, and vary from 1½ to 1¾ inches in diameter; the track stringers are 12 by 12 inches, and are in places much decayed; the floor is 5 by 8 inches, and at intervals of from 12 to 15 inches; the ribbons are 3½ by 8 inches, and are notched.

The bridge is old and weak, but not immediately dangerous, except in case of derailment of cars or locomotive. Four ribs have been added of three pieces each, 9 by 10 inches deep. Condition.

This consists of two long middle spans of 12 panels each, and panel 10½ feet long, and two short end spans, one having 9 and the other 10 panels, each 6 feet. The long spans have the customary height and breadth; the short spans are 7½ feet high, clear measure. The main braces in the small spans are 6 by 8 inches; the counters, 6 by 6 inches. The suspension rods are by twos, and vary from 1½ to 1¾ inches. The lower chord consists of two pieces, 11 by 12 inches deep; the upper chord, three pieces, each 7 by 10 inches. In the short spans are three sets of sway braces; the lower lateral bracing is 6 by 6 inches. The flooring is 6 by 6 inches, and at intervals of 9 inches; lateral rods, 1½ inches. The floor beams are 7 by 14 inches, and 4 to a panel. Big Darby, 2 miles east of W. Jefferson. Deck Howe Truss.

The main braces vary from 7 by 11 to 9 by 11 inches, with an extra piece at the end. The rods are by couples, and vary from 1½ to 2 inches. The lower chord pieces are 6, 7, 7 and 6 inches broad, and 14 inches deep; the upper chord is 12 inches deep. There are several sets of sway braces, 6 by 7 inches. The structure is 35 feet above the creek. Large spans.



The ribbons are 5 by 8 inches, and notched. The long spans form a continuous bridge. Masonry good.

6. Little Miami, from Xenia to Springfield.

No. 110, over  
Little Miami,  
between  
Xenia and  
Springfield.

These 10 panels, each  $11\frac{1}{2}$  feet; height, 22 feet. Lower chord, 4 pieces, 6 by 13 inches. The upper chord is 10 inches deep; the width is 18 feet. Main braces, 8 by 10 inches. Floor beams, 6 by 14 inches, and five to a panel. Track-stringers, 10 by 11 inches. Flooring, 4 by 10 inches, and 10 inches apart. There are four arch ribs, each triple, the pieces being 8 by 9 inches vertical. Bridge very poor, and will not last much longer.

No. 108, Howe  
Truss, Mas-  
sie's creek.

Total length, 121 feet. The chords are as in the preceding, are like those in all respects, except in this, all the pieces are weaker.

Both bridges (110 and 108) should be replaced soon. The chief reason why they have not been condemned is, that only few loads are hauled on this line, and these are not large. Two years is as long as either can hold out

7. Little Miami, from Xenia to Dayton.

1st.

A half Howe Truss; total length,  $58\frac{1}{2}$  feet, of 9 panels; height, 9 feet. Main braces are 7 by 9 inches. Track-stringers, 10 by 12 inches; main rods,  $1\frac{5}{8}$  inches. Built in 1877, and good.

Little Miami.

This is a plate girder of 3 spans, 60 feet each; depth, 6 feet; stiffened in the usual way; and two small approaches, each 25 feet long, and  $2\frac{1}{2}$  feet high. Very good.

No. 61, Har-  
bine's.

This is 77 feet long, having 8 panels, of  $9\frac{5}{8}$  feet each, 22 feet high, out to out. The rods are  $1\frac{3}{4}$  inches; timbers, 7 by 9 inches; chords, 24 inches, total breadth, and 12 inches deep; upper chord is 10 inches deep, and of the width of the other chord. Built in 1872, and will shortly be replaced.

No. 65.

Bridge over a roadway; 8 panels, 10 feet each; breadth, 14 feet; total height,  $23\frac{1}{2}$  feet. Main braces, 10 by 10 inches; counters, 7 by 10 inches; rods are by threes, and vary from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. Road beams, 7 by 14 inches, and 5 to a panel. The bridge is new, except the flooring, which is to be immediately rebuilt. There are two approaches, each 25 feet, of which the stringers are 18 by 23 inches; old, but strong.

East side of  
Dayton.

An iron Keystone bridge of 7 panels,  $14\frac{1}{2}$  feet each; the counters at the end are  $\frac{3}{4}$ -inch square bars; the mains are double,  $2\frac{1}{2}$  inches square. End posts, Phoenix column, 9 inches; middle, 6 inches column. The end chord is double, and consists of 2 bars, 6 by 2 inches, and 20 inches apart; the middle counters are  $1\frac{1}{2}$  inches. Road beams are double,  $4\frac{1}{2}$  by 15 inches. Pins,  $2\frac{1}{2}$  inches. The flooring is first class in all respects. Everything good.

Bridge over  
race in Day-  
ton.

Double iron lattice, low and good, and need not be more particularly described.

No. 73, over  
the Miami at  
Dayton.

The east approach is a trestle, 70 feet long, supported by a bent in the middle, and will shortly be replaced. The main bridge consist of three spans of the respective length, 198, 178, and 175 feet. Clear width,  $12\frac{1}{2}$  feet; height, from center to center of chord,  $21\frac{1}{2}$  feet. The bridge is double, the south half belonging to the C., H. and D. There are six arches, 8 by 24 inches. The lower chord is composed of 4 pieces, two being 7, the others  $8\frac{1}{2}$  by 16 inches deep. The largest main braces are

10 by 13 inches. At the ends are three 2-inch suspension rods, and two 1½-inch rods for the connection of the arch and the bridge proper. The floor beams are 7 by 14 inches, and are 2 feet apart. The flooring is at intervals of 9 inches. The abutments and piers are well made, and in good condition.

#### 8. Dayton and Western, from Dayton to New Paris.

This is a Kellogg and Maurice structure, consisting of 10 panels, each 15 feet; 14½ feet broad; the end struts being 16 by 12 inches. The floor is 7 by 9 inches and covers half the span. The bridge is very good. No. 74, Wolf creek.

Howe Truss, 12 panels, 10½ feet; total length, 137 feet; is 14 feet wide; 22 feet high; bottom chord, 32 by 13½ inches; top chord, 32 by 12 inches. There are three panels with braces, 7 by 10 inches; two panels, 7 by 9 inches; and one, 6 by 6 inches. Flooring is first class. The rods vary from 1½ to 2 inches, and are in sets of three; the track-stringers are double, 6 by 12 inches; floor beams, 7 by 14 inches, and five to a panel. No. 75, Wolf creek.

This is a Burr Truss of 8 panels, 9 feet each; total length, 80 feet; it is 18 feet wide, and 22 feet high; having the lower chord, 14 by 24 inches; the upper, 12 by 24 inches. Braces are 9 by 9 inches; and posts, 9 by 13 inches. The flooring is very good; track-stringers are 11 by 11 inches; the floor beams are 7 by 14 inches, and three to a panel. No. 79.

This is a Howe deck; 91 feet total length; *bad*, and is to be immediately replaced. No. 83, Swan creek.

This is a counterpart of 83, and will be speedily rebuilt. No. 86, Mill creek.

Deck Burr truss of 10 panels, each 8¾ feet; total length, 87 feet. It has a breadth of 18 feet, out to out; 21½ feet high, with lower chords, 14 by 26 inches; the upper, 12 by 26 inches. Main braces, 9 by 9 inches; posts, 7 by 13 inches. Floor is first class. Track stringers, 12 by 12 inches; and road beams, 7 by 14 inches. No. 89, Twin creek.

This is a short span of 55 feet, and is to be immediately rebuilt; wherefore specifications are not given. No. 90, Brindley's, 30 miles from Dayton.

This is a trestle of 5 bays, 20 feet each, on frame bents; the stringers are double, and are 8 by 20 inches, oak, and very strong. Flooring first-class. No. 98, New Paris.

#### 9 C., C. & I. C., from Richmond, through Greenville to Columbus

Side by side with No. 98, just described, stands No. 93 of the C., C., & I. C. road, in all respects a mate to 98, except that it is on piles. No. 93.

On the road from Richmond, Indiana, to Greenville, Ohio. This is 125 feet total length, with first-class flooring; the stringers double, and 8 by 18 inches, new. Good trestle. No. 89, White Water.

Pile trestle, 49 feet at the main stream; total, 110 feet, and entirely similar to No. 89, just given. No. 86, White Water.

Like the preceding.

Pile trestle of 29 bays; total length, 361 feet, and is 20 feet high. No. 76.

Pile trestle of 5 bays; total length, 80 feet, and all good. The flooring is in all cases as good as can be desired. No. 72.  
No. 71.

This is an iron Keystone structure of the usual style, 144 feet long, on new abutments resting on the solid rock. First-class. No. 68, Greenville creek.

Covington; four spans, 42 feet each; total, 200 feet, with end panels. The rods are in threes, and vary from 1½ to 2 inches. The main braces where heaviest, are 9 by 12 inches; and the counters, 8 by 8 inches. No. 60, White river.

No. 54, Miami  
river.

At Piqua; Howe Truss, one span of 70 feet, and two of 140 feet each; total length, 350 feet; breadth, 14 feet, and 20 feet clear height. The flooring is very good. Road beams 5 to a panel, 7 by 14 inches. In the smaller span the chords are 12 by 26 and 10 by 26 inches; in the longer spans, they are 14 by 32 and 12 by 32 inches. The smaller span, main braces are from 6 by 10 to 8 by 10 inches; the other, 9 by 6 to 9 by 12 inches. The rods are in sets of two in the short span; three in the longer, and vary from  $1\frac{1}{2}$  to 2 inches.

No. 48, Lost  
creek.

Trestle, 3 bays, in all 69 feet; stringers, double, 8 by 20 inches.

No. 47, Lost  
creek

Total length of trestle, 60 feet; double stringers, 8 by 18 inches; old, but will do service for a year or two more.

No. 44, Lost  
Run.

Total length of trestle, 44 feet; like the above.

No. 42, Nettle  
creek.

Eight bays on piles; height, 33 feet, where greatest, 108 feet. Stringers, half 8 by 16; the other, 8 by 20 inches.

No. 35, Mad-  
river.

Low pile trestle, 12 bays; 205 feet total; all fair.

No. 18.

$40\frac{1}{2}$  feet total; double stringers, 8 by 16 inches.

No. 8, Darby.

Two spans, new; Keystone structure, 7 panels of 15 feet each; total length, 212 feet. Usual form; good.

No. 7, Sugar  
Run.

Three bays; total, 72 feet. There are 2 stone piers, and pile trestles, or supports between.

Scioto river.

Five miles from Columbus. Iron deck bridge; three spans, each 140 feet, fifty feet above low water. Piers and abutments appear good, with the exception that the east abutment is, in some places, cracked a little, apparently along the natural planes of stratification, but without injury to the structure at present. Iron inner guard rails are in place, and ribbons 6 by 8 inches, and well bolted. The west approach consists of a single arch (stone) of 20 feet span; the east approach, on two arches, one 20, the other 16 feet, with solid rock work of 20 feet, intermediate between the arches. The floor beams are 8 by 14 inches, and are set very close together.

The upper chord consists of 2 channel bars,  $\frac{3}{8}$  inches thick, 15 inches deep, with flanges  $3\frac{3}{8}$  inches, and two plates 17 by  $\frac{3}{8}$  inches; space between channel bars is  $9\frac{1}{4}$  inches. The main strut, or inclined end support, also consists of two channel bars of  $\frac{3}{8}$  inch, iron, 12 inches deep with flanges 3 inches, and two connecting plates, 17 by  $\frac{1}{4}$  inches.

The double suspension bars in the body of the truss vary from 3 by  $\frac{3}{4}$  inches to 5 by  $1\frac{1}{4}$  inches. Only the center panel and the one next to it have counter bars; the one  $1\frac{3}{8}$  inches, the other 1 inch. The pins in the lower chord are  $3\frac{1}{2}$  inches. In the panel adjoining the center point of the truss there are 10 panels, each 14 feet; the lower chord consists of 6 bars, of which 4 are 5 inches deep and  $\frac{3}{4}$  inch thick; the remaining two are of the same depth, but are  $1\frac{1}{2}$  inches thick. The adjoining panel has 4 bars, of which 2 are  $\frac{3}{4}$  inch, and the others  $1\frac{1}{2}$  inches thick; all the pieces are five inches deep. In the third panel from the center, are 2 bars,  $1\frac{1}{8}$  inches thick; in the two outer panels the thickness is 1 inch.

The vertical posts consist of double channel bars and connecting plates, varying from 7 by 2 inches flange, and  $\frac{1}{4}$  inch thick; width, 11 inches to 12 by 3 inches in flange, and  $\frac{3}{8}$  inch thick, and of 13 inches width. There is also the usual cross bracing below; besides the sway braces. Other particulars will be found on page 98, book 1, of descriptions, accompanying this report. The bridge is one of exceedingly fine construction.

This bridge is near the Piqua shops in Columbus. Howe truss; two spans each 8 panels, 12.6 feet long, total length of each span, 104 feet, having a clear breadth of 14, and clear height between chords, of 18.8 feet. The lower chord has 4 pieces 6 by 13 inches, and is double bolted at intervals of 2.8 feet with  $1\frac{1}{2}$ -inch bolts. The lateral diagonal braces are 6 by 6 inches. The main braces vary from 8 by 8 inches to 8 by 11 inches in the usual order; the counters vary from 6 by  $6\frac{1}{4}$  inches to 8 by 11 inches. The suspension rods vary from 2 to 4 in number, and from  $1\frac{1}{4}$  to  $1\frac{3}{8}$  inches in size.

No. 1, Olen-  
taugy.

The track stringers are double, 7 by 12 inches. The floor beams are 7 by 14 inches set at intervals of  $2\frac{1}{2}$  feet from center to center, and are bolted at short intervals to the stringers. There is an inner guard rail of iron, and outer ribbons 5 by 8 inches let 3 inches into the floor beams, i. e., they are notched down to a depth of 3 inches on all the beams. The floor is 4 by 8 inches, covering half the space. The pier and the abutments are very good.

Over the Scioto. Iron Pratt Truss of three spans, each 135 feet. Standing on first class masonry. In each span are 9 panels of 15 feet each. The bars of the lower chord are all 5 inches deep, the middle span having four bars  $1\frac{1}{2}$  inches thick; the next panel, 4 pieces, 1 inch; the next, 2 pieces  $1\frac{1}{2}$  inches thick, and the long double end panel, 2 bars,  $1\frac{1}{2}$  inches. The cross rods in the middle panel are  $1\frac{1}{4}$  inches square; those in the successive panels, in order, are 3 by 1, 4 by 1, and 5 by 1 inches; respectively, and of course are double. The suspension bars in the end panel are  $2\frac{1}{2}$  by 1 inches. The flooring consists of ties 6 by 7 inches at 16 inches interval from center to center. The track stringers are I beams, 18 inches deep, with flanges 10 inches wide, total, stiffened in the usual way. Under the ends of the floor ties are outer track stringers of pins 7 by 14 inches. The ribbons are 6 by 7 inches, and are bolted at intervals of  $6\frac{2}{3}$  feet. The lower lateral rods are  $1\frac{3}{4}$  inches, and diminish toward the center of the bridge, as the strains require. The inclined end struts are 12 by 16 inches, and are made of the usual form with channel bars and connecting plates. The road beams are iron plate I beams, 2 feet 4 inches deep, of sufficient thickness and width of flange, stiffened by 4 vertical angle irons fully riveted. The posts are 8 by  $12\frac{1}{2}$  inches, stiffened by zigzag short pieces.

Near the  
Penitentiary.

Other particulars can be seen on page 6, book 1, before mentioned. The whole structure is pronounced first class in every way.

Street bridge. Plate girder, north side is 164 feet, south side, 127 feet; supported by two iron bents, 36 feet long, a post being in the center, and one at each end. The posts are composed of 2 channel bars, 10 inches in width,  $\frac{3}{8}$  inch thick, with flanges  $2\frac{1}{2}$  inches. These channel bars are connected by a plate, whose thickness I could not ascertain. The posts are joined at top and bottom by double channel bars of the same size as the posts. The bents are also strengthened by cross bars or rods, 2 inches in diameter in each half of the bent. The posts stand on stone blocks  $2\frac{1}{2}$  feet square. The abutments are stone and of good construction; length, 36 feet. The floor is 7 by 8 inches, and at 8 inches intervals. The ribbons are 7 by 8 inches, notched and bolted at intervals of 4 feet.

Columbus, at  
Penitentiary.  
Double track.  
Three plates.

The plates are 5 feet by  $\frac{1}{2}$  inch, stiffened at intervals of 4 feet by angle irons  $\frac{3}{8}$  inch thick, and 3 by 3 inches. On the north side of the

bridge, it is divided into three unequal spaces by the two bents, the west end being 54 feet, the middle 60, the east end 50 feet; the corresponding measures on the south side are 45, 40, and 42 feet. The top and bottom flange plates are equal, so far as rule measure can determine. The west end top plate is 14 inches wide and  $\frac{5}{16}$  inch thick; re-enforcing plate extends half length of the span. The top plate of the north middle span is re-enforced by two additional plates 14 inches wide, of the same thickness as before, and the top one is 20 feet, the next, 28 feet long, properly riveted. The middle span of the center plate has three extra plates, 12, 24, and 30 feet long,  $\frac{5}{16}$ ,  $\frac{5}{16}$ , and  $\frac{7}{16}$  inches thick; the top plate being  $\frac{7}{16}$  inches thick; double angle irons—top and bottom—5 by  $3\frac{1}{2}$  by  $\frac{1}{2}$  inches. The east end has 2 extra plates  $\frac{3}{8}$  inch thick. Remainder not re-enforced. Floor beam at 12 feet intervals. Floor beams 20 inches deep,  $\frac{3}{8}$  inch thick, with strong angle irons; gusset pieces are set at each floor beam. Track stringers are I beams 15 by  $\frac{1}{2}$  inches, with flanges 5 inches. The structure is exceedingly strong.

## II. MARIETTA & CINCINNATI RAILROAD.

1. Main Line, from Hamden eastward to Parkersburg; commencing at the first bridge east of Hamilton, and thence eastward.

No. 44.

Two miles from Hamden; Howe Truss, deck, built in 1863, is old and needs rebuilding; and will shortly be rebuilt. Special notes and measurements for this bridge, and all others on the M. & C. will be found in note book No. 4.

No. 45, Elk Fork.

Trestle, 3 bays, each 30 feet. Trussed girder with two 2-inch rods on each side. Flooring good; ribbons, 7 by 7 inches. Trestle is strong, but will soon be replaced by a bridge, and the track will be raised 2 or 3 feet. The rails are from 18 to 25 feet above the bed of the stream. Masonry first class.

No. 46, built 1871; Warren.

Triangular iron truss, 20 feet high, 14 feet broad. Masonry, first class. Lower transverse I beams, 6 inches; brace rods,  $1\frac{1}{2}$  inches. Road beams 6 by 14 inches, 15 inches apart; ribbons 1 by 12, full bolted. The end pins are 3 inches; the intermediates,  $2\frac{1}{2}$  inches. The chords are double channel bars, 12 inches, with flanges 3 inches, all  $\frac{3}{8}$ -inch iron. The end struts are 9-inch phoenix columns. There are nine panels, of which 7 are 12 feet, the other two 11 feet; total length, 96 feet. The middle suspension pieces consist of two plates of  $\frac{5}{8}$ -inch iron 9 inches wide, and set at 10 inches apart, and connected by bridging braces. The next strut parallel to the end strut is a beam of the same description, but is 8 inches. The tie bars from the summit of the end struts are double, 4 by 1 inch. Good.

The structures next following are numbered by the Inspector, there being few numbers on the structures. This is done for convenience.

No. 2.

No. 1. Trussed girder spans, one of 30 feet, two of 25 feet. The former with two 2-inch rods, the latter with one 2-inch rod on each side of the road. The remainder of the trestle is such as to make a total length of 150 feet on long span. Stringers are double, 7 by 15 inches; on the shorter spans, 7 by 14 inches. These are corbels.

Three 30 feet trussed girders, exactly like the preceding, and ordinary trestle, to make a total of 150 feet.

No. 3.

Four 30 feet trussed girders, like the preceding, and 30 feet high; excellent flooring, and good abutments.

No. 4.

Exactly as the last, No. 3, except there are four trussed girders.

Like No. 4, except the abutments are much cracked.	No. 5.
Same as No. 5, except the defects of the abutments.	No. 6.
There follows an arched tunnel, 400 feet long.	Tunnel.
Trestle over Hewitt's Fork, about 200 feet long, having two trussed girders near the center—low and strong, as is all the trestle on the main line. All the flooring in guards are of the very best, and need not be specifically mentioned with every structure.	No. 7.
Trestle about 160 feet; usual length of bay, 15 feet. Three trussed girders	No. 8, Hewitt's Fork.
Three trussed girders of 30 feet each, and 90 feet trestle additional.	No. 9, Hewitt's Fork.
Two spans, each 37 feet; three 2-inch truss rods on each side. The abutments are heavy stone, badly bedded, and considerably broken. The middle of the stringers is supported by double frame bents resting on the rods.	No. 10.
Two trussed girders, 30 feet; two 15 feet bays, similar to the others.	No. 11.
One trussed girder, 30 feet; 3 bays, 15 feet each. One abutment is the natural rock; the other fair, but not first-rate.	No. 12.
Tunnel, 350 feet long, with rock roof; sides, earth.	Tunnel.
Three trussed 30 feet girders, and 5 bays, of 15 feet each; trestle work.	No. 13.
Same as No. 13; strong, all strong.	No. 14.
Three 30 feet trussed girders; 3 spans ordinary trestle.	No. 15.
A 70 foot trestle over the road, 5 or 6 miles west of Athens; will be rebuilt shortly.	No. 16.
Two 30 feet trussed girders; 3 bays; ordinary.	No. 17.
Two 25 feet trussed girders.	No. 18.
A short, good trestle.	No. 19.
Two spans, Howe Truss; 10 panels, 10 feet each. The counters are all 6 by 9; the main braces vary from 7 by 9 inches to 8 by 9 inches. The rods are in pairs, and vary from 1½ to 1¾ inches; at the end there are two extra 1-inch rods. The ribbons on this road are very large. Width, clear, 14 feet; height, 20. Built in 1865, but well preserved, and will require renewal within two or three years. The abutments and pier are good.	Hocking river.
Linnville; Truss; two spans, 127 feet each; 8 panels, 15 feet each; width, 14½ feet; height, 21 feet. The posts are 6-inch iron columns. The end strut consists of 2 channel 8-inch bars, of ½-inch iron; and plate of same thickness, and 15 inches wide. Pins, 3¼ inches; brace rods, 1½ inches. The cross beams are hollow cylinders; the chords in the two end panels are two 12-inch channel bars, with 2½-inch flanges; all joined with the customary bridging stays. The counter rods are 1½, 1½ and 1½ inches, respectively. The suspension bars, or main stays, are double, and those at the center, 1½ by 1½ inches; the next set, 2¼ by 1¾ inches, and the end ones, 2¾ by 2 inches. In the long end double panel, the suspending bases are 1¾ by 1¼ inches. In the two center spans, the two next the center, but on one side of it, have besides the 12-inch bars two bars additional, of 4 by 1 inches. The east abutment has been somewhat injured by ice.	Hocking river.
Linnville; two spans, 137 feet each; 9 panels, same as the preceding, except the iron is a little heavier, ½ inch each way in the end tie, and others similarly. Masonry, good; additional chords, 5 inches.	Second bridge over the Hocking.



Third over Hocking. Same kind as the preceding, 147 feet long; additional chords, 6 inches deep.

Fourth Two short spans of 5 panels each, 75 feet each span; and one long span of 10 panels. In all respects similar to the preceding.

Fifth Eight panels; same in general as the preceding.

Sixth Two spans, 10 panels in each, and like the preceding.

Single span, 35 feet, the struts being two channel bars of  $\frac{1}{4}$ -inch iron, 18 inches deep, with flanges 2 inches. The chord consists of 2 bars 2 by  $1\frac{1}{2}$  inches; and there are four  $\frac{1}{4}$ -inch supporting rods, square.

Plate girder. Four 30 feet plate girders with plate 3 feet deep, and flanges 10 inches, well braced, are all right and strong. All the preceding have good stone abutments with solid stone approaches, except where otherwise given.

Little Hocking. A low span iron Keystone structure; deck, sixty feet above the water. Masonry, first-class. Ten panels,  $11\frac{2}{10}$  feet; each  $13\frac{1}{2}$  feet high. End supporting bars, 3 inches square. Then follow 450 feet of trestle from 6 to 20 feet high, having bays  $12\frac{1}{2}$  feet. Seven years old; and will be filled.

Ohio river, Parkersburg; Keystone. From the first pier in the water, on the west bank of the river, the track-stringers and floor beams are of  $\frac{3}{8}$ -inch iron, 15 inches deep, and flanges 4 inches. There are 16 panels,  $11\frac{1}{2}$  feet each. Floor and ribs as usual. The upper chord consists of two plates, 20 inches wide, and  $\frac{1}{4}$  inch thick, connected by two I beams and two channel bars,  $\frac{3}{8}$  inch thick and 9 inches deep. The next span westward is a Bollman Truss of 9 panels, 12 feet each. The long bars are from 1 by  $1\frac{1}{2}$  to  $1\frac{1}{2}$  by  $2\frac{3}{4}$  inches. The upper chord is octagonal, 4 inches in size. Track-stringers are double I beams, 12 by  $4\frac{1}{2}$  inches. Then follow 5 more spans of 9 panels each, same length, Bollman pattern. Then next come 34 bays of trestle work, from 18 to 26 feet high, and 12 feet in length each. Each bent has two transverse and two longitudinal braces, besides two lateral stays set in diagonally. Next is one Bollman Truss of like dimensions with the preceding Bollman.

2. Short branch to Marietta.

Ballast, etc. The road bed is good and in good condition, and the track is fenced.

No. 1, Sugar Creek. This consists of 16 panels, each  $12\frac{1}{2}$  feet, and is 28 feet high at the highest point; it has frame bents with vertical and batter posts, but without bracing or guards. Flooring as the preceding, and is racked greatly for want of support by the missing guard rails.

No. 2, Gully. A frame trestle, 22 feet high, having 22 bays of  $12\frac{1}{2}$  feet each; total, 275 feet. In all respects like No. 1, except it is a little older.

No. 3, small stream. Trestle, frame, 250 feet total length; 31 feet high at the highest point. In all respects like No. 1. It is 7 or 8 years old. Some timbers have been replaced, others should be, and the bridge builder assured me that it would shortly be done.

No. 4, small rivulet. Eleven bays or spaces between bents, all  $12\frac{1}{2}$  feet, which is uniform on this branch. Total length, 137 feet; highest point, 20 feet. Some of the timbers show marks of decay. There are good guard rails.

No. 5. Nineteen bays, 237 feet; 19 feet high; very similar to the others.

No. 6, Scott's Run. Frame trestle, 48 feet high and 350 feet long. The middle third is cross-braced, and the highest part is to be rebuilt this year. It has two 2 story frame bents, and heavy long timbers and sloping braces.



Fourteen bents; length, 175 feet, total; is 8 or 10 feet high; is newer No. 7. and better than the others.

Is a large stone culvert, and is as substantial as can be.

No. 8.

Short span of 25 feet over road; sufficiently secure.

No. 9.

Muskingum river bridge, at Marietta. Three spans, Howe Truss, and two approaches. The west approach has 2 twenty-feet spans over a roadway, and also 3 ten-feet spans about 8 feet high.

Marietta.  
Muskingum  
river.

Iron, Keystone; 137 feet long, 21 feet high, and 21 feet broad from center to center. The posts are made of 4 angle or channel bars, 3 by 3 inches, and  $\frac{5}{8}$  inch thick, separated at 2 inches interval, and smaller at the end. The end strut is composed of 2 channel bars of  $\frac{1}{2}$ -inch iron, 8 by 2 inches flange, and plate of  $\frac{1}{4}$ -inch iron 14 inches broad. The suspension bars at the end of the 1st panel are 2 channel bars,  $4\frac{3}{4}$  by 1 by  $\frac{5}{8}$  inches thick.

Next to these,  
draw bridge.

The lower chord is made of  $\frac{1}{2}$ -inch iron, 9 inches deep, and  $2\frac{1}{2}$  inches flange. The floor beams are iron,  $\frac{3}{4}$ -inch thick, double, and with flange 5 inches. The sustaining bars are square, and in the 1st panel from the center are  $1\frac{3}{4}$  inches; in the next panel,  $1\frac{1}{2}$  inches; in the third,  $1\frac{3}{8}$  inches; in the fourth,  $1\frac{1}{4}$  inches. The counters in these panels are 1 inch,  $1\frac{1}{8}$  inches, and  $1\frac{1}{2}$  inches. The upper chord is like the end posts or struts. The vertical bars vary from  $\frac{5}{16}$  to  $\frac{5}{8}$  inch thickness by 3 inches broad.

Eighteen panels, 10 feet 5 inches each; total length, 200 feet, very nearly. Width, 18 feet; height,  $23\frac{1}{2}$  feet from center to center of chord. The chords are quadruple, each piece being  $9\frac{1}{2}$  inches thick, and 16 inches deep in the lower, and 14 inches in the upper part. The floor beams are 8 by 16 inches, and 5 to a panel. The lateral braces are 5 by 7 inches. End posts, 8 by 8 inches, with 3 one-inch iron rods.

Main bridge,  
1st span.

The main braces are very strong, varying from 8 by 16 inches at the end, to 6 by 16 inches in the center with counters from 6 by 12 to 7 by 12 inches. The vertical rods are triple in the two panels nearest the center, and are  $1\frac{1}{2}$  and  $1\frac{5}{8}$  inches in diameter; in the remaining 7 panels there are 5 rods each, varying from  $1\frac{1}{4}$  to  $2\frac{1}{4}$  inches.

The second span has also 18 panels with size of timbers, irons, etc., 2d span. the same as in the 1st span.

Sixteen panels, each 10 feet 4 inches. The braces and irons are slightly lighter than in the larger spans; particulars are to be found in the smaller books herewith returned.

3d span.

Is a frame trestle of  $12\frac{1}{2}$  feet spans, and total length, 75 feet. The larger part of it is about 17 feet above the earth. The whole structure is to be classed with the good structures of the kind.

3. Portsmouth branch, from Portsmouth to Hamden.

Near Portsmouth. At trestle 240 feet long; spans,  $12\frac{1}{2}$  feet; timbers, 12 by 12 inches; height above ground, about 20 feet at the highest point; good, but destitute of guard rails.

Trestle, No. 1.

About 2 miles out. Same length of panel as all trestles on this road, viz.:  $12\frac{1}{2}$  feet; total length, 140 feet, and about 10 feet high. Ties are loose; no ribbons, and the structure is poor, but not immediately dangerous.

No. 2.

Munn's Run, 225 feet total, and at highest point 25 feet above ground. In the middle is a trussed girder, 30 feet long, having double rods of 2 inches diameter.

No. 3.

- No. 4, trestle. Seventy-five feet long, 12 feet high, with wooden foundation; not first class.
- Condition of track. The first 2 miles from Portsmouth are not ballasted; the next 4 miles the track is about half ballasted with slag. Track quite rough for four miles.
- No. 5, Scioto-ville. Total length, 100 feet. In the center is a trussed girder 30 feet long, having a single 2-inch rod on each side. These are heavy 8 by 9 inch ribbons, properly placed.
- 1 mile east of Scioto-ville. Howe Truss. Two spans, each 100 feet, having each 9 panels of 11 feet length. The masonry is first class, and the bridge is sound, although it has been built 30 years. Bridge covered. The floor has ties 5 by 8 inches at intervals of 10 inches. The floor beams are 7 by 13 inches, and 4 to a panel; the track stringers are 10 by 10 inches. The lower chord has 4 pieces, 13 inches deep, and two are 5 inches, and the other two 6 inches broad. The vertical rods are in pairs, and are all  $1\frac{1}{2}$  inches in diameter. The main braces are all 7 by 10, and the counters 7 by 7 inches.
- W. approach. The west approach is 200 feet long, 40 feet high; of the usual form, but without braces; the ribbons are good, 8 by 8 inches; timber notched on the ties.
- East approach. The east approach is like the west in general; is 400 feet long, and 2 years old.
- 1 mile from the preceding. Another, 300 feet long; the foundation all wood. It is about 25 feet above ground, and strong enough.
- No. 9. Is 140 feet long, and is in all respects like those before named in span and timbers, sufficiently strong.
- No. 10. One hundred and forty feet long with 2 trussed girders, 30 feet each, near the middle, having two 2-inch rods on each side. Height, about 20 feet.
- No. 11. One hundred feet long, 15 feet high, with one trussed girder in the center. At this point there is no ballast for a mile or two.
- Ballast. The chairs are all old-fashioned, and of course bad; the ties, in many places, are old and decayed.
- Chairs. Three bents and one trussed girder of the usual form; 12 feet high.
- No. 12. Three 30 feet trussed girders, 6 feet high; all good.
- No. 13. One short span of 15 feet, and one trussed girder, 30 feet long, 6 or 8 feet high.
- No. 14. Two 30 feet trussed girders, and one span of 15 feet, all 6 or 8 feet high.
- No. 15. Like 15 in all respects.
- No. 16. Like 15 also, except the girders are 5 feet shorter.
- No. 17. One span, 15 feet; one 25 feet girder, having a single rod on each side; and one 30 feet trussed girder, with double rods.
- No. 18. Four panels, 50 feet long, and 8 feet high.
- No. 19. Same as No. 19.
- No. 20. Same as No. 19, except it is 10 or 12 feet high.
- No. 21. Is 62 feet long, and 10 feet high.
- No. 22. Is 75 feet long, and 12 feet high; all of these in fair condition.
- No. 23. Has two spans of  $12\frac{1}{2}$  feet each, and one of 20 feet, with double track-stringers. These last seemed weak when subjected to the weight of the locomotive.
- No. 24.

Fifty feet long, 6 or 8 feet high.	No. 25.
Same length, and a little higher.	No. 26.
Same as 25, except it is a couple of feet higher.	No. 27.
Two bents of 12½ feet each; and one trussed girder, 25 feet long.	No. 28.
Like 28, except the trussed girder is 30 feet long.	No. 29.
Has one 12½ feet span, and two 25 feet trussed girders.	No. 30.
Has one 12½ feet span, and two 30 feet trussed girders.	No. 31.
Is 50 feet long, and 8 feet high.	No. 32.
The first station east of Webster. Trestle, 75 feet long, 6 feet high.	No. 33.
Same height as No. 33, but only 50 feet long.	No. 34.
Two bents, and one 25 feet trussed girder.	No. 35.
There followed 3 or 4 low trestles, 40 feet long; all strong and good.	Others.
62 feet long, and 6 feet high.	No. 36.
Has two bents, together 25 feet, and one 25 feet trussed girder.	No. 37.
At the cross-roads, 10 miles before reaching Jackson, the track for half a mile is in bad condition, and the ties are rotten.	Bad place.
100 feet long, 8 feet high; 3 miles from Jackson.	No. 38.
Same as 38.	No. 39.
Near water station, has two bents, and one 30 feet trussed girder.	No. 40.
Has three bents, and two 30 feet trussed girders.	No. 41.
Is 50 feet long.	No. 42.
Same as 42.	No. 43.
62 feet long, 7 feet high.	No. 44.
Is 140 feet long, and 7 or 8 feet high. These trestles in general are all that can be desired, but being so low, most of them should be changed to embankments.	No. 45.
4. Main Line, from Hamden westward to Blanchester.	
At Richland Furnace, in Vinton county, is a rock tunnel, 300 feet long; and two short arched tunnels.	Tunnels.
This is a deck Howe Truss, 60 feet long, and 10 feet high, 14 feet wide, with rods from 1¼ to 1¾ inches diameter, and braces, all 6 by 6 inches. The chord is triple, 6, 8 and 6 inches, respectively, and 13 inches deep.	Bridge No. 43.
Each 98 feet long, and both to be rebuilt in the month of August, 1881.	Nos. 42 and 41.
Howe Truss, 110 feet long, 14 feet wide, and 20½ feet clear height. The masonry is first class. There are 10 panels, each 10 feet. The ribbons are 8 by 10 inches, notched; the flooring is 6 by 8 inches, and 4 inches apart. The track-stringers are double, and 5 by 12 inches. The lower chord has 4 pieces, 6 by 14 inches; the upper, 12 inches deep. The main braces vary from 8 by 9 inches to 9 by 10 inches; the counters, all 7 by 9 inches; the rods triple, varying from 1¼ to 2 inches.	No. 40—near Raysville.
An exact copy of 40, in all respects.	No. 39.
Trestle; three 30 feet trussed girders; the stringers are double, and are 8 by 15 inches. Besides these, there is an extra support under the end of the ties. Ribbons, 8 by 8 inches, notched; truss rods, 2 inches; first class masonry.	No. 38.
Two spans, Howe Truss; one 151, and one 149 feet long, of usual height and width. The main braces vary from 7½ by 11 to 10½ by 11 inches. The vertical rods are in sets of three, and vary from 1¼ to 2½ inches.	No. 37—Salt creek.

inches. The lower chord is quadruple, two pieces  $6\frac{1}{2}$ , and two 8 inches, and all 15 inches deep. The upper chord is 2 inches less deep. The floor is very good and close. The heavy ribbons are notched; lower laterals, 6 by 7 inches.

No. 36—Wal-nut creek.

Fink deck bridge of 8 panels, each 11 feet. Total length, say 88 feet. Built 1879. The floor beams are 6 by 12 inches, and are 10 inches apart. The lateral cross-pieces are double channel bars, 6 by 2 inches; tie rods, diagonal,  $1\frac{1}{4}$  inches. The upper chords are quite heavy. Posts are Phoenix column. The half-span bars are 4 by  $\frac{7}{8}$  inches; the quarter, 3 by  $\frac{3}{4}$  inches; the eighth,  $2\frac{1}{2}$  by  $\frac{5}{8}$  inches. Bridge good.

No. 35.

Halt Howe Truss, built in 1875. 61 feet long, 10 panels of about 6 feet each. The main braces are from  $6\frac{1}{2}$  by  $7\frac{1}{2}$  to  $7\frac{1}{2}$  by  $7\frac{1}{2}$  inches; the counters, all 5 by 6 inches. The chords have three pieces, two  $5\frac{1}{2}$ , and one 8 inches thick, and all 13 inches deep. The upper chord has the usual 2 inches less. The rods are in couples, and vary from  $1\frac{1}{4}$  to  $1\frac{7}{8}$  inches.

No. 34—Scioto river.

The two westernmost spans have been converted into trestles, each having 5 bents of 25 feet each, and 15 others, at each end of the structure. The rails are about 21 feet above ground on the average. The stringers are 8 by 14 inches, and double; the ties, 6 by 8 inches, at 10 inches intervals; ribbons, 8 by 10 inches. Timbers, 12 by 12 inches. Truss rods, 2 inches, and single. The masonry might have been first class, but owing to bad bedding, some blocks are broken. The trestle is good.

Scioto river.

The bridge proper is a Howe Truss of five spans, 151 feet each, of the usual width, clear, 14 feet; and clear height,  $21\frac{1}{2}$  feet. The two at the ends were built about 1877 or 1878. The middle span is old, and will be immediately replaced. A description of one is, of course, a description of all. In each span are 16 panels,  $9\frac{1}{4}$  feet each. The middle main braces are 7 by 11 inches, and vary to  $10\frac{1}{2}$  by 11 inches. The counters are all 8 by 11 inches, except those in the end panels. The vertical rods are by threes, and are  $1\frac{1}{4}$  inches. These increase toward the end of the span—the last set containing 5 rods, of which three are  $2\frac{1}{8}$  inches, and two  $1\frac{1}{8}$  inches. The floor is close and good. The track-stringers are double, 5 by 12 inches. Lower lateral braces, 6 by 7 inches; the tie rods,  $1\frac{1}{4}$  inches. The floor beams are 6 by 14 inches, and 5 to a panel. The lower chord has four pieces, of which two are  $6\frac{1}{2}$ , and two 8 inches wide, and 15 inches deep; the upper chord being the same, except the depth is 13 inches.

No. 33—canal bridge near Chillicothe.

This is a Warren or triangular truss of 8 panels,  $13\frac{1}{2}$  feet each, of 15 feet width, and height, say 27 feet. The struts are Phoenix columns of 8 inches diameter. The ties at the end panels are double, and are 4 by  $1\frac{1}{4}$  inches. Those in the middle of the bridge, sloping from the lower chord upward and outward, are plates, 8 by  $\frac{5}{8}$  inches, with angle irons,  $2\frac{1}{2}$  inches, extending the whole length. The cross lower lateral bracing is by I beams and diagonal rods. The road beams, 6 by 14 inches, at intervals of one foot. The upper chord is similar to the end struts. The lower chord has two I beams in the outer double panels, of  $\frac{1}{2}$ -inch iron, 12 inches deep, and angle irons,  $2\frac{1}{4}$  inches. The second triangle has, besides these, two bars, of  $\frac{3}{4}$ -inch iron,  $3\frac{1}{2}$  inches deep. The bridge and its foundations are first class.

This is a Howe Truss of 8 panels,  $9\frac{1}{2}$  feet each ; total length, 84 feet ; width, 14 feet ; height,  $20\frac{1}{2}$  feet, clear. The main braces vary from  $7\frac{1}{2}$  by  $9\frac{1}{2}$  inches to  $8\frac{1}{2}$  by  $9\frac{1}{2}$  inches ; the counters are all 7 by 9 inches. The vertical rods are in pairs, and range from  $1\frac{1}{4}$  to 2 inches. The lower chord has 4 pieces, 6 by 12 inches ; the upper, the same, except the depth is 10 inches. Floor, 8 by 5 inches, and 5 inches apart. The track-stringers are 10 by 12 inches, and single ; ribbons, 7 by 8 inches, notched and bolted ; road-beams, 6 by 14 inches, at intervals of 21 inches. The upper and lower, laterals and diagonals are in the usual style. This bridge seems a little light for the traffic which passes over it, but being short, no danger is to be apprehended, except in case of an extra heavy load.

No. 32—bridge over the roadway, near the preceding.

A low Howe Truss of 2 spans, 54 feet each. The braces vary from 6 by  $7\frac{1}{2}$  inches to  $7\frac{1}{2}$  by  $7\frac{1}{2}$  inches ; all the counters are 5 by 6 inches ; ribbons, 7 by 8 inches, bolted and notched ; flooring, 6 by 8 inches, and 9 inches apart ; track stringers, 10 by 10 inches ; laterals as usual ; the road beams are 6 by 13 inches, and 2 feet apart ; the chords are triple, the pieces being 5, 8, and 5 inches wide, and 12 inches deep ; the upper being only 11 inches deep.

No. 31—east of Anderson's station, 6 miles from Chillicothe.

The bridge sunk considerably under a passing train, and I judge that it is hardly strong enough ; a heavy load might cause disaster.

Half a mile or so east of the preceding is a trestle-work 50 feet long, 4 frame bents, 12 feet high, with track stringers 12 by 13 inches ; floor, ribbons, and lateral bracing as the preceding.

Trestle.

Low Howe Truss, in all respects like No. 31, just given, except it is stronger. At each end is an approach 20 feet long, supported by frame bents.

No. 30—west of Anderson's.

The west approach to the main bridge is a low Howe Truss of two spans, clear height  $7\frac{1}{2}$  feet ; 10 panels, each  $5\frac{1}{2}$  feet. The main braces vary from  $6\frac{1}{2}$  by  $7\frac{1}{2}$  inches to  $7\frac{1}{2}$  by  $7\frac{1}{2}$  inches ; the counters are 6 by 6 inches ; the rods are in pairs, and vary from  $1\frac{1}{4}$  to  $1\frac{3}{4}$  inches ; road beams, 6 by 14 inches, and 21 inches apart ; upper chord, triple,  $5\frac{1}{2}$ , 8, and  $5\frac{1}{2}$  inches broad, and 11 inches deep ; the lower chord is 1 inch deeper ; track stringers, 5 by 10 inches, double and notched ; floor, 8 by 6 inches, at 6 inches distance ; ribbons,  $7\frac{1}{2}$  by  $9\frac{1}{2}$  inches, notched ; chord, covered with tin ; the abutments and piers are good.

No. 29, North Fork of Paint creek.

This has two spans of 11 panels, 10 feet each, usual height and width, and covered. In the east span the counters are all 6 by 9 inches ; the mains vary a little, but are all very nearly 7 by 10 inches ; the vertical suspension rods are in couples, and vary from  $1\frac{1}{4}$  to  $1\frac{3}{4}$  inches ; the lower chord in both spans consists of 4 pieces, 6 by 14 inches ; the upper, 6 by 12 inches ; the track stringers are double, 5 by 10 inches ; flooring, 6 by 8 inches, at 6 inches interval ; ribbons,  $7\frac{1}{2}$  by  $9\frac{1}{2}$  inches, notched ; lateral braces, usual size ; the road beams in the east span are 7 by  $12\frac{1}{2}$  inches, and  $2\frac{1}{2}$  feet apart ; those in the west span are 6 by 14 inches, and 2 feet apart. The long end of the west span is re-enforced by two iron rods and stirrups.

Main bridge.

Howe Truss, not very old—uncovered. It has 11 panels of  $10\frac{1}{4}$  feet each ; height and width same as usual ; main braces vary from 6 by 9 to 8 by 10 inches ; the counters are all 6 by 9 inches ; lower chord has 4 pieces, 6 by 13 inches ; the upper 4 pieces, 6 by 13 inches ; track stringers

No. 28, a mile or two further west.

are  $4\frac{1}{2}$  by 10 inches, and double, and notched on the road beams; lateral braces as usual; the floor is 8 by 10 inches, and at intervals of 10 inches. Five castings on the north chord, and four on the south chord are crushed and useless.

No. 27, North Fork of Paint creek.

This bridge is bad, and should be shortly replaced. The west approach consists of four 32-foot trussed girders, double, 7 by 14 inches; double rods, 2 inches; cross-braced skew frame of 12 inch oak, 12 feet high.

Iron bridge, unusual pattern.

Good abutments and pier. The west approach is 10 feet high, and the bents are 12 feet apart, and 8 panels. The track stringers are oak, and double, except in two spaces (where they are 12 by 12 inches), and are 7 by 12 inches; the ribbons are 7 by 9 inches, and notched.

The main bridge is of a peculiar structure, unlike anything else seen in the State. It has 10 panels, each  $14\frac{1}{2}$  feet, is  $13\frac{1}{2}$  feet in clear breadth, and 28 feet high. The road beams are 6 by 14 inches, and 15 inches apart; the ribbons are 8 by 10 inches, and notched; the end struts and all the posts are Phoenix columns, varying from 6 to 9 inches in diameter. The upper and lower bracing, the vertical suspension members, and the sway bracing, can not well be given in words. In place of more description, reference is made to page 28, book 2, accompanying this report, for pencil sketches of the parts spoken of. The chord in the double end-panel consists of double  $\frac{3}{8}$  inch channel bars, 12 inches deep, with flanges 3 inches wide, the two being set at 13 inches clear interval. The next double panel has the chord re-enforced by two  $\frac{5}{8}$  inch bars, 3 inches deep; the next panel is also re-enforced by two bars  $1\frac{1}{2}$  inches thick and 3 inches deep. I deem it one of the best bridges in the State.

It should have been stated that the vertical suspension bars in the middle of the double panels, are of  $\frac{3}{4}$  inch iron,  $2\frac{1}{2}$  inches wide.

No. 26, 1 mile east of Roxabell, over Little Creek.

Howe Truss of 10 panels, each 11 feet, 14 feet wide,  $19\frac{1}{2}$  high in the clear; good stone abutments. The bridge is covered. The main braces vary from 6 by 9 to 8 by 10 inches; the counters are all 6 by 9 inches. The vertical suspension rods are in pairs, varying from  $1\frac{3}{8}$  to  $1\frac{5}{8}$  inches. At the two joints next to the abutment at each end, two additional suspension rods have been added, 1 and  $1\frac{1}{4}$  inch in diameter, respectively. Road beams, 6 by 13 inches, 2 feet apart; the lower chord has four pieces, 6 by 13 inches; the upper chord is 11 inches deep; the track stringers are  $4\frac{1}{2}$  by 10 inches double, and notched on the road beams; the flooring is 3 by 8 inches, at intervals of 1 to  $1\frac{1}{2}$  feet; the floor is consequently bad, and there are no guard rails of any kind; the lateral bracing is of the usual form and strength. The bridge is not good, and should be watched carefully, and be soon rebuilt.

No. 25,  $\frac{1}{2}$  mile w. of Roxabell

Iron plate girder, 36 feet long, with stone abutments, all most excellent.

No. 24, 1 mile e. of Lyndon.

Fink Truss, 100 feet long, 54 feet above the creek. There are long, deep fills on both approaches, and two stone arches of about 20 feet span at each end of the main bridge. I found it impossible to take any measurements. The bridge is a deck bridge, and there were neither ropes nor ladders whereby the structure could be reached. The flooring is all right, and there is proper protection in case of derailment of cars. The bridge seems good and strong.



Half Howe Truss; 8 panels, 6 feet each;  $7\frac{1}{2}$  feet clear height; breadth, 14 feet. The braces are 5 by 6 and 7 by  $7\frac{1}{2}$  inches; the rods in pairs, and vary from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inches; the lower chord has 3 pieces, 5, 8, and 5 inches wide, and 13 inches deep; the upper differs in the usual way; the road beams are 6 by 13 inches; the track stringers are 10 by 12 inches, broadside up, and notched 3 inches on the floor beams; flooring, 6 by 8 inches, and 1 foot apart; ribbons, 8 by 10 inches, notched, and full bolted. There is a 20 feet approach, at each end of the bridge, supported by frame bents. Here the stringers are 12 by 14 inches, and are placed broadside up. Structure sufficiently strong.

No. 23, near Lyndon on the west.

Part trestle and part regular Howe deck, over 800 feet long and 54 feet above the bed of the stream. In course of renewal; over 500 feet of new trestle completed when the examination was made in July. The stone piers are 50 feet apart, and between these a frame base is made for intermediate bents. The piers are built to such a height that 40 feet only remain for the framework of the trestle. These bents are double story, each 20 feet, with vertical and batter posts, and braces between the vertical and the batter posts. The base of the frame bent is 20 feet from side to side, the timber being all foot-square oak. At the top of the lower story there are foot-square longitudinal braces firmly bolted to the vertical posts, and to each other. The bays are thus made 25 feet lengthwise of the road. Abutting on the aforesaid longitudinal pieces are braces extending each way to the middle of the 25 feet span, and supporting a swinging cap. The intervals between the center of the supports is  $12\frac{1}{2}$  feet. There are also the usual track stringers, floor-beams, flooring, and guard rails. The structure, as far as completed, is exceedingly strong—much better than any bridge ever before at this place.

No. 22, Paint Creek, at Greenfield.

Sixty-four feet above the bed of the creek, it is 10 feet wide; has floor beams 6 by 13 inches, 11 inches apart; there are four panels—the main bars are double  $\frac{3}{4}$  inch bars, 4 inches deep; the  $\frac{1}{2}$  bars are  $2\frac{3}{8}$  by 3 inches. The ribbons are heavy, and are notched down and bolted; the cross-bracing is by small channel bars. Bridge good.

No. 21, Fink Creek, Walnut creek.

Four Howe trusses, two of them low or half; the other two of ordinary height. Of the former, one is 30, the other 50 feet deck. The long span has 7 panels each 10 feet; breadth 11 feet. The main braces vary from 6 by 8 inches to 7 by  $8\frac{1}{2}$ ; the counters are 6 by 7 inches. The rods are in couples, and vary from  $1\frac{1}{2}$  to  $2\frac{1}{8}$  inches. The lower chord has the usual four pieces  $5\frac{1}{2}$  inches wide and 11 deep; upper, same, excepting this, that the two middle sticks are replaced by a solid stick. The floor beams and flooring, and lateral bracing, as usual. In each span there are sway braces. Masonry good.

No. 20, Rattlesnake, at Monroe.

Two spans. Fink deck, and 50 or 60 feet above the creek. In each span are 8 panels of 16 feet each. The 4 main bars are 4 by 1 inch; the  $\frac{1}{2}$  bars are  $3\frac{1}{2}$  by  $\frac{3}{4}$ ; the  $\frac{1}{4}$ ,  $2\frac{3}{8}$  by  $\frac{3}{4}$  inch. The cross-braces are double channel bars 6 inches deep with 2 inches flange. The middle post is 25 feet long; the half post, 20; the quarter, 10 feet. The top chord is 16 inches diameter, and is octagonal. The floor beams are 6 by 15 inches, and are placed 6 inches apart. The ribbons are 8 by 10 inches, and notched.

No. 19, Lee's creek.



- No. 1, Westboro', built 1876.** 5. Hillsboro' Branch, from Blanchester to Hillsboro'.  
Half Howe truss, deck; span 48 feet; 8 panels, each 6 feet; 8 feet high, 14 wide. Top chord three pieces,  $5\frac{1}{2}$ , 8, and  $5\frac{1}{2}$ , and 13 inches deep; lower, 11 inches deep. Main braces vary from 6 to  $7\frac{1}{2}$ , to  $7\frac{1}{2}$  by  $7\frac{1}{2}$  inches; the counters are 5 by 9 inches. The lateral and sway braces all 6 by 6 inches. Floor beams, 6 by 14. Rods in pairs, from  $1\frac{1}{4}$  to  $1\frac{1}{8}$  inches. The abutments are high, and considerably cracked; stone piers have been built up, on which the bridge rests.
- Turtle creek, 1875.** Howe half truss, 10 panels,  $6\frac{1}{2}$  feet each; total 61 feet. Width, 14 feet;  $7\frac{1}{2}$  high. Lower chord consists of three pieces,  $5\frac{1}{2}$ , 8, and  $5\frac{1}{2}$  by 13 inches; upper, 4 inches. The timbers are the same size as in the preceding, except the floor beams are only 13 inches deep. The floor is open, and there are no guard rails.
- Near Lynchburg on Hillsboro' branch. Entered here by mistake. Another.** Two trussed girders, each 37 feet long, with triple 2-in. rods. String pieces 15 by 8 inches, and double. Floor covers half the space—good. The ribbons are heavy. Half a mile away is a 30 feet trussed girder, of similar construction.
- All these abutments are stone, and are good.
- Remark.** The greater part of this branch road is fenced, but the ditches are neglected and overgrown with weeds and grass.
6. Main Line, from Blanchester westward.
- No. 18, trestle w. of Vienna.** Trestle, 8 or 10 feet high, 400 feet long, width 25 feet. Trussed girder; frame bents, close, good floor; heavy notched ribbons. Secure.
- Another,  $2\frac{1}{2}$  miles further.** Another trestle 175 feet long, 6 to 10 feet high; 3 trussed girders, each 25 feet, with double 2-inch rods. Everything good.
- Near Farmers' Station, trestle.** Say, 440 feet long, from 8 to 15 feet high; timbers 12 inches square. Double stringers, 8 by 14 inches; close floor; good ribbons
- O'Bannon cr'k. Built 1878.** Half Howe, two spans, each  $60\frac{1}{2}$  feet, 10 panels;  $7\frac{1}{2}$  feet high; lower chord 6, 8, 6 inches by 13; upper, 11 inches. Braces, from  $6\frac{1}{2}$  by 8 to  $7\frac{1}{2}$  by 8; counters and laterals, 6 by 6; rods, in pairs,  $1\frac{1}{4}$  to  $1\frac{1}{8}$  inches; floor beams, 6 by 14 inches. Close floor—good abutments in all these.
- No. 16, O'Bannon cr'k. 1879.** Howe, 2 spans, each 8 panels,  $8\frac{1}{2}$  feet each; total, 69 feet. Breadth 14 feet, height  $20\frac{1}{2}$  feet. Lower chord has four pieces, two  $5\frac{1}{2}$  and two 6 inches, and 13 inches deep. The upper chord is the same, except the depth is 11 inches. Main braces from 7 by  $8\frac{1}{2}$  inches, to  $8\frac{1}{2}$  by  $8\frac{1}{2}$  inches; counters, 7 by 8 inches; rods double, and from  $1\frac{1}{4}$  to 2 inches. Lateral braces and ties as usual; floor beams, 6 by 14 inches.
- East span, half Howe; 10 panels, each  $5\frac{1}{2}$  feet. Timbers same size as in No. 1 on Hillsboro' branch, mentioned above.
- No. 15, O'Bannon cr'k. 1879.** Two spans, each 61 feet, in all essentials the same as No. 17.
- No. 14, same creek. 1879.** Two spans, Howe truss, each 8 panels,  $9\frac{3}{4}$  feet, 14 feet wide,  $20\frac{1}{2}$  feet high; bottom chord four pieces 6 by 13 inches; upper has depth of 11 inches; main braces vary from 7 by  $9\frac{1}{2}$  to  $8\frac{1}{2}$  by  $9\frac{1}{2}$  inches; counters all 8 by 8; rods, in pairs,  $1\frac{1}{4}$  to 2 inches. Usual lateral bracing; floor beams 6 by 14 inches. Fair bridge.
- No. 13, same creek.** Howe truss, two spans, each 68 feet; lower chord four pieces, two  $5\frac{1}{2}$ , two 6 inches by 13. Other measures same as No. 17, above.
- No. 12, Little Miami, at Loveland.** Three equal iron spans, Keystone build, 19 $\frac{1}{2}$  feet high, 14 wide; 8 panels, 15 feet each. The end batter post or strut consists of a plate  $\frac{1}{2}$  inch thick by 15 inches wide, and two channel bars 9 inches, with flanges  $2\frac{1}{2}$  inches. In the panel next the middle point the suspension

inclined bars are double, and are  $1\frac{3}{8}$  inches square ; in the second panel  $1\frac{3}{8}$  inches square, in the next  $2\frac{1}{4}$  inches square. The counter in the panel next the middle of the bridge is a single square bar  $1\frac{3}{8}$  inches ; the adjoining panel  $1\frac{1}{8}$  inches, and in the third panel 1 inch square. The posts are 6-inch Phoenix columns, of  $\frac{1}{2}$ -inch iron. The suspension rods in the double-end panel are  $1\frac{1}{2}$  inches square, and double. The center of the lower chord is composed of four pieces of  $\frac{3}{4}$ -inch iron, 6 inches deep ; the adjoining panel has two bars  $1\frac{1}{8}$  inches by 5 ; the next, two pièces 4 inches by 1 ; the last panel, two pieces 2 inches square. The pins are  $3\frac{1}{2}$  inches. The road-beams are two  $\frac{1}{2}$ -inch I beams 15 inches deep, with flanges  $4\frac{1}{2}$  by 1 inch. The track-stringers are also double-I beams of  $\frac{3}{8}$ -in. iron, 10 inches deep by 4 inches in the flange. The west pier is slightly damaged by ice. Bridge good.

Howe truss, 10 panels, 8 feet ; 14 feet wide,  $20\frac{1}{2}$  high ; chord, four 6-inch pieces, 13 inches deep in the lower, and 17 in the upper ; main braces vary from  $7\frac{1}{2}$  by 9 to  $8\frac{1}{2}$  by 9 inches ; counters all 8 by 8 inches. Laterals and floor and masonry all good. There is a short approach of two panels  $12\frac{1}{2}$  feet each, strong.

No. 11, Sym'es' Station. 1879.

Baltimore Bridge Co., Fink ; deck ; 10 panels, 12 feet ; total, 124 feet ; floor beams 14 inches apart. In all essentials the same as No. 19, Lee's creek. The east approach to the bridge is a trestle from 25 to 32 feet high, and 300 feet long ; track stringers double, 7 by 13 inches ; heavy guard rails, and excellent masonry.

No. 10, Sycamore creek. 1870.

Half Howe truss ; 8 panels,  $6\frac{1}{2}$  feet ; total length, 52 feet ;  $7\frac{1}{2}$  feet high. All the timbers have the dimensions of No. 1, Hillsboro' branch, above given.

No. 9, Madis'n.

Three trusses, side by side ; double track ; 8 panels,  $5\frac{1}{2}$  feet each,  $7\frac{1}{2}$  feet high ; triple lower chord, 6,  $8\frac{1}{2}$ , and 6 by 13 inches ; upper chord, 11 inches ; rods from  $1\frac{1}{4}$  to  $1\frac{3}{8}$  inches ; main braces from 6 by 8, to 8 by 8 inches ; counters, 5 by 6 inches, and laterals 6 by 6 inches ; floor beams, 6 by 14 inches.

No. 8.

Two Howe trusses side by side, 8 panels, 10 feet each ; total length,  $81\frac{1}{2}$  feet ; 14 feet wide,  $21\frac{1}{2}$  feet high, center to center ; mains, 8 by 10, counters, 7 by 8 inches. The lower chord has four pieces 6, 7, 7, and 6 inches wide, 14 inches deep ; the upper is 2 inches less deep ; rods from  $1\frac{1}{2}$  to  $1\frac{3}{8}$  inches.

No. 7, Miami canal.

No. 6, same as No. 8 above.

Double iron, 8 panels,  $10\frac{1}{2}$  feet, 21 feet high, 25 feet wide ; pins,  $2\frac{3}{4}$  to 3 inches ; masonry good ; the chord in the double end panel consists of two bars, 4 inches by 1 ; in the next two panels there are four bars 4 inches by 1. The columns are Phoenix, 7, 7, 8, and 9 inches, respectively. Suspension bars crossing the two panels next the center of the bridge, are 4 by  $1\frac{1}{4}$  inches ; the corresponding counter is  $1\frac{1}{2}$  square. The suspension members in the next outward panel are 5 by  $1\frac{1}{2}$  inches. The double vertical suspension bars are 3 by 1 inch in the end panel. The stirrups are  $1\frac{1}{8}$  inches square ; flooring, 6 by 6 inches ; ribbons, 9 by 10 inches. The track-stringers are 7 by 15 inches, and double. The road-beams are double ; channel-bars 12 inches deep, with a 3-inch flange, and are trussed by two 4 by 1-inch bars.

No. 6, same as No. 8, above. No. 5, Miller's k.

The north side is 8 panels like No. 5, only lighter ; side by side with this is the south side. Through Fink, 106 feet long, 14 broad, and 21 feet high. Posts are Phoenix columns, 6 and 8 inches in diameter. The  $\frac{1}{2}$  length bars are 3 by  $\frac{7}{8}$  inches, and are double ; the  $\frac{1}{4}$  bars are  $2\frac{1}{2}$  by  $\frac{5}{8}$

No. 4, Lower mill creek crossing.

inches, also double; and the  $\frac{1}{8}$  bars are 2 by  $\frac{1}{2}$  inches. There are diagonal or bridging braces above and below. The chord is of  $\frac{3}{8}$ -inch iron I beam, 12 inches deep.

No. 3, Colerain pike; 2 side by side.

Iron. Unusual form; 82 feet long. The end strut is substantially a Phoenix column, 9 inches diameter. The lower chord has 2 channel bars of  $\frac{1}{2}$ -inch iron, 12 inches deep. The bridge height is 20 feet, the breadth, 14 feet. The long double panels have two diagonals; the upper half of the two are pinned together at the center of the double panel; the lower half of each diagonal is a single piece  $1\frac{1}{4}$  inches square. From this center pin there also hang two suspension bars of  $\frac{3}{4}$ -inch iron  $2\frac{1}{2}$  inches wide. The vertical suspension rods in the end double panel are of the same dimensions. The upper chord is a Phoenix beam. The road beams are of the usual size and strength. For a rough sketch of the method of joining the parts, reference may be made in book No. 4, herewith submitted.

The companion bridge is a Fink truss of the same length, breadth, and height. The posts are Phoenix columns. The chord is composed of 2 channel bars of  $\frac{1}{2}$ -inch iron, 12 inches deep with 4 inches flanges. The end pin is 3 inches in diameter. There is the usual horizontal bracing in a skew bridge. The  $\frac{1}{2}$  bars are of  $\frac{3}{8}$ -inch iron, and are  $2\frac{1}{2}$  inches deep; the  $\frac{1}{4}$  bars, of the same size; the  $\frac{1}{8}$  bars are of  $\frac{1}{2}$ -inch iron, and are  $1\frac{1}{2}$  inches deep.

No. 2, street bridge.

In this iron truss the diagonals all cross two panels, as shown in the sketch on page 62, book 4. There are 12 panels; total length of bridge, 145 feet. Breadth, 15 feet; height, 27 feet; six to 9 in. Phoenix columns. The track stringers are I beams, 15 inches deep with 4-inch flanges; the road beams plate, 20 inches wide, with 4-inch angle irons. The stirrups are double, and are 2 inches square. Floor, good; ribbons, heavy. In the 6th panel from the end, one of the two middle panels, the chord is composed of 4 bars 4 inches deep, and  $1\frac{1}{2}$  inches thick. The 5th panel, same number and depth, but  $1\frac{1}{2}$  inches thick. The 4th panel, same number and depth, but only 1 inch thick. The third panel has two bars 4 inches deep, by  $1\frac{1}{2}$  inches thick; the 2d panel has 2 bars of  $\frac{5}{8}$ -inch iron, 3 inches deep. The first panel has two  $\frac{1}{2}$ -inch bars, 6 inches deep, bridged together for the usual strains. The suspension members, which pass from the outer end of the 1st panel at the top to the inner end of the 1st panel of the truss below, are two bars 3 inches wide, and  $1\frac{1}{2}$  inches thick; the bars running also from the end of the upper chord to the lower chord across the first and second panels, have the same depth, and are  $1\frac{1}{2}$  inches thick. The next two parallel to the last named bars are 3 inches deep, and 1 inch thick; the next 3 by  $1\frac{3}{8}$  inches; the last parallel bars in the half length are really double  $1\frac{3}{8}$ -inch rods. The pieces which play the part of counters, are, from the center outwards,  $1\frac{3}{8}$ ,  $1\frac{1}{2}$ , 1, 1, and 1 inches, respectively. Bridge, firm.

No. 1, in Cincinnati, over roadway.

There are 3 bridges side by side. The one on the west, is a  $\frac{1}{2}$  Howe truss, 64 feet total; 10 panels,  $6\frac{1}{2}$  feet long, 14 feet wide,  $7\frac{1}{2}$  feet high. The lower chord is triple, 5, 8, 5 inches broad, and 13 inches deep; the upper chord, 11 inches deep. Main braces from  $6\frac{1}{2}$  by  $7\frac{1}{2}$  to  $7\frac{1}{2}$  by  $7\frac{1}{2}$  inches; counters, 5 by 6 inches. Lateral braces, 6 by 6 inches; rods, 1 inch. Floor beams, 6 by 14 inches, 3 to a panel. The track stringers are 12 by 12 inches. The floor beams are suspended by 2 1-inch iron rods. There are no guard rails.

The east side is a plate girder  $4\frac{3}{4}$  feet deep. The top plate is of  $\frac{1}{2}$ -inch iron, 10 inches wide, re-enforced by 3 others in the usual way, by offsets; these being of  $\frac{3}{8}$ -inch iron, and 12 inches wide. The topmost piece is 8 feet long; the second, 28 feet; the third, 40 feet long. Width of bridge, 14 feet; length, 64 feet. Floor beams, 6 by 15 inches at 7 inches interval. The rails are laid directly on the floor beams. There are double ribbons on both sides; the outer one, 10 by 9 inches, the inner, 6 by 8 inches, and notched. The lower braces are  $2\frac{1}{2}$  by  $2\frac{1}{2}$ -inch angle irons. There are also diagonal angle iron braces 4 by 4 inches,  $\frac{1}{2}$  inch thick.

The middle bridge is of the same length as the other two, is  $20\frac{1}{2}$  feet high, 28 feet wide, and has a double track crossing it. The track stringers are double I beams of  $\frac{1}{2}$ -inch iron, 10 inches deep with flanges 4 inches. There are also beams under the ends of the ties, 7 by 14 inches. The ribbons are 7 by 9 inches, and notched; the flooring is 6 by 6 inches, and at intervals of 5 inches. The floor beams are hollow, rectangular tubes, 24 inches deep, and 12 inches wide; the upper and lower plates being 1 inch thick. The top chord is hexagonal, 6 inches on a side; under the lower chord is a perforated I beam to resist thrust, 8 by 3 inches flange. The end struts are 8 inches hexagonal hollow beams of  $\frac{3}{8}$ -inch iron; the lower chord has two bars,  $4\frac{1}{2}$  by 1 inches; the middle post is 8 by 8 inches Phoenix column. The double bars running from the end of the upper chord to the inner end of the 1st double panel, are 2 by  $\frac{1}{2}$  inches; those starting at the same point, and running one panel further towards the center, are  $2\frac{1}{2}$  by 1 inches. The counter to the first set is a single bar, 2 by 1 inches.

The main track of the road is in good condition, as regard ballast and fencing, and is clean and well kept.

### III. CINCINNATI, HAMILTON, & DAYTON RAILROAD.

#### 1. Main line, from Cincinnati to Hamilton.

Double Howe Truss, of 16 panels,  $9\frac{1}{2}$  feet each. Each passage way is 14 feet wide, and  $21\frac{1}{2}$  feet high. This bridge is propped under every joint, and, of course, is bad, and will be shortly replaced. There is an east approach of 8 panels, 10 feet each, and 20 feet above ground at the highest point. These two stone arches together extending 75 feet; the floor is all right. The measurements are given on page 71, book 4.

No. 1, Mill  
creek, Cincin-  
nati.

On this road all the ribbons are  $3\frac{1}{2}$  by 5 inches, and bolted at intervals of 4 feet; all the flooring is 4 by 10 inches, and set at 2 inches apart; all the floor beams are 7 by 14 inches, and five to a panel; all the track stringers are 12 by 14 inches; all the tie rods,  $1\frac{1}{2}$  inches; all the lower laterals are 6 by 7 inches.

This fact is stated here once for all.

Howe Truss 7 panels,  $11\frac{1}{8}$  feet; total length, 85 feet, 14 feet wide, 22 feet high. The main braces vary from 9 by 12 to 11 by 12 inches; the counters are all 8 by 9 inches; the vertical rods are from 2 to  $2\frac{1}{4}$  inches, and are in threes.

No. 3, Cum-  
minsville.  
1879.

Two spans; double Howe; 10 panels,  $10\frac{1}{8}$  feet; 110 feet, total; 14 feet wide, 22 feet high; covered. The main braces vary from 8 by 10 to 9 by 10 inches; the counters are all 8 by 9 inches; the rods are in sets of three, and vary from  $1\frac{1}{4}$  to 2 inches. The chords in one span are 7, 8, 8, and 7 by 14 inches in one, and about  $\frac{1}{2}$  an inch less in the other. Upper chord is 12 inches.

No. 4, Fair  
Grounds.  
1879.

The pier is somewhat damaged by the ice, but is protected by piles in V shape. Bridge, good.

No. 5, 10 miles out. 1879-80. Same as No. 4; covered. Also a trestle 7 spans, 15 feet; caps, 12 by 14 inches; posts, 14 by 14 inches, on sills 5 feet deep in the ground say 15 feet high.

No. 6, above Carthage. 1878. Half Howe; 10 feet high; 9 panels, 6 feet; total length, 60 feet; width, 14 feet. Sides covered, double, skew. The masonry is good. Lower chord triple, 6, 8 and 6 inches by 14; upper, 2 inches less.

No. 7. 1877. Howe; ten panels,  $10\frac{1}{2}$  feet; total, 112 feet; width, 14; height, 22, from center to center; covered. Same as No. 4 in all essentials. Masonry is good, of 6-inch stone.

2. Cincinnati, Hamilton and Indianapolis, from Hamilton to Oxford.

No. 1, Hamilton. 1875 or 1876. Half Howe; street bridge in Hamilton, near east end of viaduct; 12 panels, 6 feet each. Lower chord triple, 6, 8 and 6, respectively, 15 inches deep; upper chord, 12 inches deep. Rods in pairs, and vary from  $1\frac{1}{2}$  to 2 inches. Three floor beams to a panel; mains all 8 by 9; counters, 5 by 6 inches. Five or six years old.

No. 2, Miami river. Howe-deck; 4 spans, 16 panels each, and each panel  $10\frac{1}{2}$  feet; breadth, 14 feet; height, 17 feet. Bridge undergoing renewal, with timbers a little larger than the former ones. Particulars given on page 16, book 3, accompanying this report. The east approach is one arch of 34 feet span. The west approach consists of 17 arches, each 34 feet span. The spring of the arch at the river is 9 feet above ground; at the hill, 3 feet. The base of the piers near the river is 7 by 17 feet, and the height varies from 25 to 30 feet. The lower side of the bottom chord is 27 feet above low-water mark in the Miami. The river piers have never been injured by ice, and they are in good condition. The panels are not long, but the spans are; hence, the structure must be made of heavier timber than that usually required; and it is so constructed. There are sway braces in each alternate panel, 5 by 8 inches, and the irons are proportionally strong.

No. 3, Oxford. 1875 or 1876. Howe-deck; 12 panels,  $10\frac{1}{2}$  feet each; total, 125 feet long. The lower chord has four pieces, 7, 8, 8 and 7 inches wide, 15 inches deep; the upper is smaller by the usual amount. End main braces, 10 by 12, very heavy for so short a structure. Rods, from  $1\frac{1}{4}$  to 2 inches. Covered, and entirely safe; built 5 or 6 years.

3. Cincinnati, Richmond and Chicago, from 3 miles north of Hamilton to Richmond.

No. 1. 1876. Half Howe; 10 panels, 6 feet; total, 69 feet;  $9\frac{1}{2}$  feet high. Main braces, 6 by 8 inches; counters, 5 by 6 inches; chords, triple; lower is 5, 8 and 5 by 12 inches deep, with usual decrease for the upper. The masonry is fair.

No. 2. 1876. Half Howe; 4 panels, 6 feet; total, 31 feet. The height and timbers agree with the preceding, the rods a trifle smaller.

Condition of the track. Along this part of the road the track is in first-rate condition.

No. 3, Seven Mile. 1873. Howe; 8 panels,  $11\frac{1}{2}$  feet; total, 97 feet; width, 14 feet; height, 22 feet, center to center. The rods are in threes, and vary from  $1\frac{3}{8}$  to  $1\frac{3}{4}$  inches. Main braces, from 7 by 10 to 8 by 10 inches. Counters, 7 by 8 inches. The lower chord has 4 pieces, two 5 and two 6 inches wide, and 14 inches deep; the upper chord is 12 inches. The structure stands on frame abutments.

Howe Truss; two spans of 12 panels,  $10\frac{1}{2}$  feet each; total length of both, 264 feet. The masonry is fair. The lower chord has 4 pieces, 7, 8, 8 and 7 inches wide by 14 inches deep; the upper, 2 inches less deep. The braces are from 8 by 12 to 9 by 13 inches. The counters are all 8 by 9 inches, width and height as usual on this line. The rods are by threes, and vary from  $1\frac{1}{2}$  to  $2\frac{3}{4}$  inches. No. 4, Seven Mile. 1879.

Howe Truss; 8 panels,  $11\frac{1}{4}$  feet; total, 98 feet. In all respects a counterpart of No. 3. One abutment is stone, the other wood. No. 5. 1873.

Howe; two spans, each having 10 panels of  $10\frac{1}{2}$  feet each; total, 215 feet. The braces are from 8 by 10 to 9 by 10 inches; the counters are all 8 by 9 inches. The rods are by threes, and vary from  $1\frac{1}{2}$  to 2 inches. The chord has four pieces, 6, 8, 8 and 6 inches, respectively, and 14 inches deep; the upper chord is 2 inches less. This structure is of the usual height and width. Good masonry. No. 6. 1873.

Half Howe; double. Ten panels, 6 feet; total, 68 feet; nine and one-half feet high. This bridge is to be shortly (August, 1881), rebuilt, and further specifications are not demanded. No. 7. 1873.

Howe; two spans, each 10 panels, of 10 feet each; total length, 216 feet. This is also to be rebuilt very soon. Braces, 8 by 10 inches; counters, 8 by 7 inches; rods, from  $1\frac{3}{8}$  to  $1\frac{3}{4}$  inches. No. 8, Somerville. 1874.

Howe Truss; 2 spans, each having 10 panels of  $10\frac{1}{2}$  feet; total, 215 feet; 14 feet wide; 22 feet high, center to center. Same as No. 6 above. The masonry is good, except the nose of the pier has been injured by ice. No. 9, Seven Mile creek. 1878.

Half Howe; seven panels, each 6 feet; total, 41 feet. This also is to be renewed. No. 10.

Howe; two spans; total length, 220 feet. Same as Nos. 9 and 6. Bridge covered. The abutments are fair, the pier is made of very heavy stone. No. 11, same creek. 1878.

Howe; 9 panels,  $10\frac{1}{2}$  each; say total, 100 feet. Main braces, 8 by 10 inches; counters, 7 by 8. The chord has 4 pieces,  $5\frac{1}{2}$ , 6, 6 and  $5\frac{1}{2}$  inches wide, and 14 inches deep. The upper chord smaller by the usual amount. The rods are triple, and from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. Masonry is fair. No. 11, near Camden. 1872.

Half Howe Truss; six panels,  $5\frac{1}{2}$  feet; total, 37 feet. Braces, 6 by 8 inches; counters, 5 by 6 inches. Chords, solid; rods,  $1\frac{1}{2}$  inches. Marked for speedy renewal. No. 13, Camden. 1872.

Half Howe; ten panels, 6 feet each. Braces, 8 by 9 inches; counters, 6 by 7 inches. The lower chord is triple, and is 6, 8 and 6 inches wide, by 14 inches deep; upper, 2 inches less. The masonry is fair. The rods vary from  $1\frac{1}{2}$  to 2 inches. No. 14, near Camden. 1881.

Howe; 13 panels,  $10\frac{1}{2}$  feet; total length, 143 feet; usual height and breadth. The main braces vary from 8 by 12 to 10 by 12 inches; the counters vary from  $7\frac{1}{2}$  by  $8\frac{1}{2}$  to 8 by 9 inches; the rods are by threes, and are from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  inches. The lower chord has four pieces, two 7 inches, two 8 inches, all 14 inches deep; the upper varies only in height 2 inches. The masonry is good. No. 15, Barnett. 1880.

Same as 15 in all essentials. No. 16, north of Barnett. 1880.

Half Howe; 7 panels, 6 feet each—46 feet. The structure is about 10 feet above the stream. This bridge will shortly (August, 1881) be rebuilt. No. 17. 1873.



- No. 18. This is a stone arch, and does not require report.
- No. 18 $\frac{1}{4}$ , over rivulet. 1878. Strain beam, 35 feet long. The chord is 14 by 20 inches; the braces, 14 by 12 inches; rods, 1 $\frac{1}{2}$  inches.
- No. 19, near Eaton. Howe Truss; 10 panels, 10 feet each; total, 110 gate. Rebuilding.
- No. 20, beyond Eaton. Howe; in all respects the same as No. 19.
- No. 21. 1875. Half Howe; 10 panels, 6 feet 2 inches each; total, 70 feet; height, 9 $\frac{1}{2}$  feet. This is also rebuilding.
- No. 22. 1873. Half Howe; 9 panels, 5 $\frac{1}{2}$  feet; total, 60 feet. Timbers of usual size. Masonry fair. Structure to be rebuilt in 1882.
- No. 23. Short strain beam bridge.

#### 4. Maine Line, from Hamilton to Dayton.

No. 8, Miami, 2 miles north of Hamilton. Howe Truss, 4 spans. Total length, 713 feet. In the spring of 1881, the south abutment was undermined by the floods, and half fell down, destroying the east side of the bridge. Work was at once commenced to repair and to change the structure. I was informed that the two spans on the north would be changed to embankment, because the river has worked its way southward, and has left those spans over dry land. Work was going on at the middle of September, where the structure was last inspected by myself. I do not deem it necessary to give here the dimensions of the old bridge; the particulars will be found on page 80, book 4, accompanying this report.

No. 9, Elk creek. 1868. Howe Truss, 2 spans; total length, 365 feet. South span has 18 panels, 9 feet 10 inches each; the north span, 17 panels of the same length. Width, 14 feet; height, 23 feet, from center to center. There are 4 arches, 8 by 24 inches. Masonry good. Main braces run from 9 by 12 inches to 10 by 12 inches; the counters are all 8 by 10 inches. There are five rods to a panel, varying from 1 $\frac{1}{2}$  to 2 $\frac{1}{2}$  inches. Particulars are given on page 111, book 4. The chords are strong, consisting of 4 pieces, two 8, and two 9 inches thick, and all 15 inches deep. The top chord two inches less.

No. 10, Broad Run. 1880. Howe Truss; one span, 91 feet; 8 panels, 10 $\frac{1}{2}$  feet; width, 14 feet; height, 22 feet. The masonry is fair, not of the very best. The vertical rods are in sets of three, and vary from 1 $\frac{1}{2}$  to 2 inches; main braces, 8 $\frac{1}{2}$  by 10 inches to 9 by 10 inches; the counters, all 8 by 9 inches. The lower chord has 4 pieces, 5 $\frac{1}{2}$ , 7 $\frac{1}{2}$ , 7 $\frac{1}{2}$  and 5 $\frac{1}{2}$  inches, respectively, and 14 inches deep. Top chord, 12 inches.

No. 11, Twin creek. 1880. Howe Truss, 3 spans; total length, 405 feet; 12 panels, 10 $\frac{1}{2}$  feet, in each span; usual breadth and height. Rods by threes, from 1 $\frac{1}{2}$  to 2 $\frac{1}{2}$  inches. Main braces, from 8 by 12 inches to 10 by 12 inches. Counters, all 9 by 10 inches. Chords, two 7, two 8 inches; 14 inches deep, and 12 inches, as usual.

No. 12, Bear creek. 1878. Howe Truss; 12 panels, 11 feet 2 inches each; total length, 140 feet; breadth, 14 feet; height, 22 feet. Covered, and has good masonry. The lower chord has four pieces, two 6 inches, two 7 inches, and all 14 inches deep. The other chord is less in depth by 2 inches. The suspension rods are in sets of three, and vary from 1 $\frac{3}{8}$  to 2 $\frac{1}{4}$  inches. The main braces vary from 8 by 12 inches to 9 by 12 inches; the counters are 8 by 9 inches.

No. 13, Opossum Run. 1879. Total length, 68 feet.  $\frac{1}{2}$  Howe, so thoroughly covered that it was not possible to measure the parts, unless the covering should be par-



tially removed, which, of course, was not done. The masonry is good, and all the visible parts are good.

The track from Cincinnati to Dayton is fenced almost all the way, Track is in excellent condition in all respects.

5. Dayton and Michigan, from Dayton to Toledo.

Half Howe of 10 panels, each  $6\frac{1}{2}$  feet. Total length, 72 feet. Built in the usual way, and is good; the masonry also is good. No. 1, canal, Dayton. 1878.

Two spans of Howe Truss, each 14 panels,  $10\frac{1}{2}$  feet; length of each span, 150 feet. Usual height and breadth, and masonry good. Rods in sets of three, from  $1\frac{1}{2}$  to  $2\frac{1}{4}$  inches. Main braces, from 8 by 12 inches to 10 by 12 inches; and counter braces, all 9 by 10 inches. No. 2, Mad river. 1878.

Four spans, half Howe Truss, each having 12 panels, of 6 feet 1 inch each; total length of each span, 80 feet—of the four, 320 feet. Rods vary from  $1\frac{3}{8}$  to 2 inches. Timbers usual size. Masonry good, and track thus far in good condition. There is a south approach of trestle work, about 10 feet high in the average. The stringers on the trestle work are 14 by 20 inches. No. 3, Miami. Track good.

Half Howe,  $9\frac{1}{2}$  feet high; 42 feet total length; there are 6 panels, each 6 feet. The chords are 10 and 12 inches deep; rods,  $1\frac{1}{2}$  to  $1\frac{5}{8}$  inches; masonry good. No. 4, Small creek.

Bridge, 30 feet; rods,  $1\frac{3}{4}$  inches; strain beam, 10 by 14 inches; braces, 12 by 14 inches; stringers, 14 by 20 inches. No. 5, strain beam. 1876.

24 feet long, and like No. 5. Both sufficiently strong; masonry fair. No. 6, strain beam.

Howe skew; 14 feet wide, 22 feet high; seven panels,  $10\frac{1}{2}$  feet each. The rods vary from  $1\frac{1}{2}$  to 2 inches. The main braces from 7 by  $10\frac{1}{2}$  inches to 9 by  $10\frac{1}{2}$  inches; the counters are 8 by 9 inches; the chords, 12 and 14 inches, respectively, and consist of four pieces, two 6, and two 7 inches wide. The masonry is good. No. 7, canal, Troy. 1881.

There is a trestle approach on the south of 24 panels of trestle; on the north another of 7 such panels, each 21 feet long; and having stringers, 14 by 20 inches. These are good stone piers, but guard rails only half way.

Howe Truss. Two spans of 15 panels, each  $10\frac{3}{4}$  feet; total length of the two spans, 335 feet. There are also four spans of low truss, 10 feet, having in each 8 panels,  $6\frac{1}{10}$  feet long—total of the four spans, 222 feet. The masonry is good. The bridge is 14 feet wide, and 22 feet high. The lower chord is 15 inches deep; the upper, 12 inches; and each has two pieces, 7 inches, and two, 8 inches. The rods are by threes, and vary from  $1\frac{1}{2}$  to  $2\frac{1}{8}$  inches. The main braces vary from 8 by 10 inches to 10 by 12 inches. The counters are all 9 by 10 inches. These measures are for the full truss. The low truss has chords 12 and 14 inches deep, respectively, and consists of three pieces, 6, 8 and 6 inches thick. The main braces are from 6 by 8 to 7 by 8 inches; the counters, 6 by 7 inches; rods from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches, in pairs. No. 8, Miami river. 1881.

A small roadway bridge, 20 feet long, with stringers, 14 by 20 feet. Roadway. Good.

Half Howe; height,  $9\frac{1}{2}$  feet. Ten panels, 6 feet; total length, 70 feet. Rods and braces usual size. The masonry is good. No. 9. 1876.

Next follow three roadway structures, 20 feet long, and strong enough. Roadway structures.

No. 10, Mc-  
Geis's creek.  
1876.

Deck half Howe, 59 feet total. 8 panels,  $6\frac{3}{4}$  feet each. Chords, 10 and 12 inches; three pieces, 6, 8 and 6 inches thick. Rods,  $1\frac{1}{2}$  to  $1\frac{5}{8}$  inches. Guard rails loose. There are four sway braces, 4 by 8 inches. There are two approaches, each 24 feet, with the heavy sized stringers before named. The braces are 6 by 8 inches, and the counters, 5 by 6 inches.

Track.

Thus far the track is good, and the fencing is for almost the whole distance.

No. 10 $\frac{1}{2}$ , new.

This is a strain beam structure, 25 feet long, in the usual form.

No. 11, Brush  
creek. 1867.

Howe deck; 12 panels; total length, 120 feet. This bridge is quite old, and will be shortly replaced. There are sets of sway braces in every panel. There are two 40 feet approaches of the usual sort of timbers, but the surface of the bridge is 51 feet above the stream.

No. 12.

Short, new strain beam structure; form and timbers as before.

No. 13, old.  
1867.

Two spans, Howe deck; total length, 225 feet; to be rebuilt immediately (August, 1881). On the south there is a 60 feet approach, and a roadway span 30 feet long, supported by a swinging cap, and braces, 9 by 12 inches. The north approach is 30 feet, and an additional span of 15 feet, like the other.

No. 14.

Howe; 12 panels,  $9\frac{1}{2}$  feet each; total, 120 feet; of the usual width and height. The rods are by threes, from  $1\frac{3}{8}$  to  $1\frac{5}{8}$  inches. The main braces are from  $7\frac{1}{2}$  by 10 to 8 by 10 inches; the counters, all 7 by 8 inches. The chords are 12 and 14 inches deep, respectively, and have four pieces, two 6, and two 7 inches wide. The masonry is good.

On the north there is a 60 feet trestle approach, 16 feet high, and good.

Trestle, Sid-  
ney.

Old valley trestle, 30 feet high, and 150 feet long.

Over the C., C., C. & I. road, 26 feet high, and 99 feet long; having three bays. There is very strong lateral bracing of the bents; and the stringers are supported by a strain beam of  $\frac{1}{3}$  the length; timbers, 12 by 14 inches. The track here is double.

Loramies'  
creek.

Here is a good trestle, 7 or 8 feet high, and 160 feet long.

Percheta  
creek.

New trestle, 20 feet high and 150 feet long; the 5 spans are 26 feet each, and are supported by strain beams; stringers, 14 by 20 inches; caps, 12 by 14 inches; and posts, 14 by 14 inches—all good.

Auglaize river.

At Wapakoneta there are 8 spans, each 24 feet, and others sufficient to complete 242 feet of trestle. Supported as the trestle at Sidney, over the C., C., C. & I. Railroad. Very strong.

No. 15, 76 miles  
from Toledo.  
1876.

Half Howe Truss,  $9\frac{1}{2}$  feet high, similar to No. 9 preceding, 73 feet long and light.

No. 16.

Is a duplicate of No. 15.

No. 17, Hog  
creek, Lima.

There is a trestle of 13 bays, each 24 feet; total, including the shorter bays, 335 feet. It is about 22 feet high, similar to the structure at Sidney.

Ottawa.

Howe, 12 panels, 10 feet each; total, 130 feet. Rods in threes, from  $1\frac{1}{2}$  to  $2\frac{1}{8}$  inches; the main braces are from 8 by 12 to 10 by 12 inches; the counters are 8 by 9 inches; the chords are 12 and 14 inches deep, respectively, have four pieces, of which two are 7 and two 8 inches broad; the structure is 14 feet broad, 22 feet high, and stands 25 feet above the water; the masonry is good; the approaches at the ends are

of the same length, each 102 feet, consisting of 3 bays, 24 feet each, and two 15 feet, and supported as others on this road.

Thirty-eight miles from Toledo there is a small  $\frac{1}{2}$  Howe Truss, in all respects like Nos. 15 and 16, above given. No number.

#### IV. TOLEDO, DELPHOS AND BURLINGTON NARROW GAUGE.

NOTE.—The bridges on this road are all new.

##### 1. Main Line, from Toledo via Delphos to Willshire.

The north approach has 6 panels of 12 feet each, standing on frame bents, which stand on 4 piles cross-braced. The stringers are double, 8 by 15 inches; there is also a stringer under the end of the ties of equal measure. The flooring is 6 by 8 inches, and covers half the space. Ribbons, 6 by 6 inches, and notched. The bent timbers 1 foot square. Swan creek, Toledo.

This is a low Howe structure of a height of 7.6 feet, and has on each side 8 panels,  $6\frac{1}{2}$  feet each; total length, 105 feet; the counters are 6 by 6 inches; the outer main braces are 9 by 9 inches, those next the center of the half span are 7 by 7 inches, the others ranging through intermediate sizes; the braces next the center of the whole structure are 7 by 9 inches; the lower chord is 10 inches, the upper, 12 inches, and each has three sticks, 5,  $7\frac{1}{2}$ , and 5 inches wide, respectively; the long suspension rods passing over the center posts are  $1\frac{1}{2}$  inches in diameter, and are double. Posts are quadruple, and are 28 feet in height; the floor beams are 8 by  $14\frac{1}{2}$  inches, and are 3 feet from center to center; ribbons, 6 by 8 inches, notched; stringers, 6 by 12 inches, and double. Turn bridge.

Next follow 13 bays of 12 feet each, or a total of 160 feet, standing on piles, which are cross-braced with two pieces at each set of piles; the caps on the piles are 1 foot square; the stringers, 6 by 14 inches, and double, and end-bearers, 8 by 14 inches. There are corbels 4 feet long. The track is on the average 10 feet from the ground. Trestle.

Then follow two spans of Howe Truss on piles, the track running in a curve. The north span is widest at the north end; it has a clear breadth of 14 feet; the chords are 14 by 12 inches, respectively, having 4 pieces, two  $6\frac{1}{2}$  and  $7\frac{1}{2}$  inches broad, and are very strong; the lower laterals are 6 by 6 inches; tie rods,  $1\frac{1}{2}$  inches; road beams, 6 by 14 inches, and 2 feet apart; track stringers, 6 by 12 inches, and double; end beams, the same; floor and ribbons as in the last statement about these items, except the floor ties are at intervals of 6 inches. In this span are 14 panels,  $11\frac{1}{2}$  feet each; height, 20 feet clear; the main braces range from 7 by 12 to 10 by 12 inches; the counters, from 7 by 9 to 8 by 9 inches; the leaning posts at the end are 11 by 13 inches; the rods are by threes, and vary from  $1\frac{1}{2}$  to  $2\frac{1}{4}$  inches. More bridge.

The pier has 32 piles.

Pier.

The south span has 10 panels of  $11\frac{3}{4}$  feet each; the rods are by twos in the three panels nearest the center, and by threes in the south panels, varying from  $1\frac{1}{2}$  to 2 inches; chords, 11 and 13 inches, with four pieces 6 inches wide; floor beam, stringers, height, breadth, same in both spans.

The south approach has 6 bays of 12 feet each, and a trussed girder S. approach. 26 feet long, having two  $1\frac{1}{2}$ -inch rods on each side.

I should have stated that the aforementioned turn-bridge rests on a circle of about 20 feet diameter, made of numerous piles; the ends rest Turn bridge.

on a bar, which is supported by two 10-inch iron wheels, which are stationary. This center is protected by other piling, which extends about 50 feet from the protected center.

Iron roadway  
bridge.

One hundred feet long, 14 feet wide; 8 panels,  $12\frac{1}{2}$  feet each. The struts at the end are 8 by 11 inches; the suspension rods starting at the top of the end struts and running diagonally downward to the inner end of the second panel, are double and 2 inches square; the next parallel set has the bars  $1\frac{3}{8}$  inches square; the next,  $1\frac{1}{4}$ . The middle post is 8 inches square; the next, 8 by 10 inches; the next, 8 by 11 inches. The suspension bar from the middle of the end double panel is  $1\frac{3}{4}$  inches square. At the center of the bridge the lower chord consists of 4 pieces of bar iron 3 by  $\frac{7}{8}$  inches; the next outer panel, 4 pieces, 3 by  $\frac{5}{8}$  inches; the end double panel 2 bars, 3 by  $\frac{7}{8}$  inches; the piers are  $1\frac{1}{2}$  inches; the road beams, 6 by 14 inches, and three to a panel: the stirrups are double  $1\frac{3}{8}$ -inch pieces; the floor beams are triple, 6 by 12 inches; flooring, 5 by 8 inches, and 6 inches apart. The two approaches have 2 panels each, each 13 feet long.

Branch of  
Delaware cr'k.

Trestle; in the highest part 25 feet high; ten panels, 14 feet each; usual frame bents; timbers 12 by 12 inches; batter posts, 10 by 12 inches; cross-braced in both directions; floor and guard rails very good. Ballast earth, except a short distance near Toledo. The rails for 8 miles are 35 pound steel rails.

Ballast.

Rails, 10 miles  
from Toledo.

Canal bridge,  
swing.

This bridge has unequal ends. The east end has 7 panels,  $6\frac{1}{2}$  feet each; the chords are 5, 8, and 5 by 12, and 10 inches deep; there are 3 main braces at the end, 7 by 7 inches; the others are 4 by 7 inches; the end rods are double and are 2 inches in diameter; the remainder,  $1\frac{3}{4}$  inches; the suspension rods which pass over the tower are double, and have a diameter of  $1\frac{3}{4}$  inches; three floor beams to a panel, 6 by 14 inches.

The west end has 10 panels,  $6\frac{1}{2}$  feet each; end rods,  $2\frac{1}{4}$  inches; others as before; the floor is excellent; the east approach is 10 feet, the west 24 feet. There are bearing beams under the ends of the ties.

Trestles.

There is a low trestle, four feet on the average, 250 feet long. There are no ribbons, and the floor is bad; will soon be filled.

Another do.

One-half a mile beyond is another, a short one, in process of filling, and two miles further on, still another, which is to be immediately filled (Aug. 1881.)

Maumee river.

The east approach consists of 21 panels, 14 feet each; total, 294 feet. There are 4 piles in each bent, and they are cross-braced; stringers, 12 by 14 inches. The bridge has 6 spans, four of them 160 feet long each, one 140 feet, and one 120 feet.

120 feet span.

The 120 feet span has 10 panels; the rods are in couples, and range from  $1\frac{1}{4}$  to 2 inches; the main braces from 7 by 10 to 9 by 10 inches; at the end they incline, as those near the center, but there are 3 braces; the counters vary from 6 by 10 to 7 by 10 inches.

The chords are 13 and 11 inches deep, respectively, and have four 6 inch pieces. The floor beams are 6 by 14 inches, and 4 to a panel. The stringers are 6 by 12 inches, and double. Lateral braces, 6 by 6 inches; cross tie rods,  $1\frac{1}{4}$  inches. The piers are cribs, well filled with stone. The flooring is the same throughout.

140 feet span.

Twelve panels,  $11\frac{3}{8}$  feet each. The 4 panels of each half, next the center, have rods from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches; the remaining two, 2 and  $2\frac{1}{4}$

rods, by threes. The main braces vary from 7 by 8 to 10 by 10 inches—there being three at the end. The counters are all 7 by 7 inches. The chords are 13 and 11 inches deep, and consist of 4 pieces  $6\frac{1}{2}$  inches wide

The suspension rods all range from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  inches, and are by threes. The mains vary from 7 by 11 to 11 by  $12\frac{1}{2}$  inches—those at the end sloping parallel with the other main braces. The counters vary from 7 by 9 to 8 by 9 inches. Chords, 14 and 12 inches deep; four pieces, two  $6\frac{1}{2}$ , and two 7 inches. Height, 23 feet. The south approach is 42 feet long, having 3 equal spans; made as all the others on this road. Four 160 feet spans.

Trestle; 200 feet long, 6 feet high; made in the usual way

McClure.

Trestle; same size and make as the preceding.

Grelton.

Pile trestle; 10 bays, 16 feet; 10 feet high. Four piles—braced; caps, 12 by 12 inches; corbels, 8 feet long, and 10 by 12 inches. Track-stringers, 12 by 14 inches. Floor good. Venedocia.

Trestle; like the preceding—of 12 bays

Jonestown.

Ten bents; same as the two preceding.

Willshire.

Five bents; usual make.

Another.

East and west approach; pile trestle, 12 feet high; and 20 bays. The Howe Truss is like that below, over the Auglaize river (which see). St. Mary's river.

Length, 110 feet; 10 panels.

Trestle; 90 feet long, 8 feet high; usual build.

Malinta.

The ballast is sand for miles in this region; earth most of the way from Toledo. Ballast is very bad, and track rough. Ballast.

Three spans, Howe Truss; each 100 feet of 10 panels. The suspension rods vary from  $1\frac{1}{2}$  to 2 inches in pairs. The main braces vary from 6 by 7 to 7 by 9 inches. Counters, 6 by 6 inches. The chords are quite light, being three pieces, 5, 7 and 5 inches wide and 12 inches, and 10 inches deep. Floor beams, 6 by 14 inches, and 4 to a panel. Stringers, single, 10 by  $12\frac{1}{2}$  inches. There are no ribbons. The flooring is 4 by 9 inches, at intervals of 4 inches. Auglaize river.

The west approach is 9 feet high, has 10 panels of 20 feet each. Corbels, 8 feet long, and 10 by 12 inches. Track-stringers, 12 by 14 inches. There are no guard rails. The floor as given above. The abutments and piers are double frame structures on piles. West Approach.

Here is a low 100 feet trestle of 20 bays. Stringers, 12 by 16 inches. The bents are frame. The floor as before, and there are no guard rails. Ft. Jennings.

## 2. Main Line, from Delphos via Spencerville and Mercer to Dayton.

West of Delphos, about 100 rods, is a bridge on the main western line of this road. It is 40 feet long, 14 feet wide, and is A shaped, with 2 suspending rods,  $1\frac{1}{2}$  inches. Floor beams in pairs, 8 by 14 inches. Stringers, same size. The abutments are double frames. Delphos.

There is a simple swing bridge over the canal—flat on the water—and not needing further specification. Canal.

North approach, 9 feet high; three bays, each 16 feet; three stringers, 6 by 12; floor as before. The bridge itself is a half Howe Truss of 8 panels,  $6\frac{1}{2}$  feet each; total length, 60 feet. The frame is 7 feet high, and 14 feet broad. Chords, 12 and 10 inches deep, and three pieces 5, 7 and 5 inches wide; main braces, from 7 by 7 to 7 by 9 inches, and 3 in- Spencerville, canal bridge.

clined at the end, as the last strut. Rods, in couples, from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. Floor as usual.

St. Mary's  
river.

East approach consists of 4 bays, 16 feet; stringers, double, 6 by 12 inches. The west approach has 2 bays of the same kind. The piers are double frames of 12 inches square timber. The bridge has 2 spans of 4 panels each, of the Pratt variety. The end struts are 10 by 12 inches; the straining beam, 9 by 12 inches; the central braces, 8 by 12 inches; the center rod,  $1\frac{1}{4}$  inches; those adjoining,  $1\frac{1}{2}$  inches. The chord is 12 inches deep, and has two 6-inch pieces. The floor beams are 6 by 12 inches, and double.

Between Mer-  
cer and  
Celina.  
South of  
Celina.

This trestle is about 6 feet high; has 10 bays of 16 feet each; good floor, 6 by 7 inches, covering half the space.

Is a trestle, 4 or 5 feet high, 1900 feet long, with good ribbons, 6 by 6 inches.

Reservoir.

At the end of the reservoir there is another 85 feet long, of about the same height.

Another and  
another, and  
more and  
more.

Next follows another of about 6 feet high, and 540 feet long; and near by one 100 feet—of the same general structure, and all good. One of 8 bays, 16 feet each; similar to the preceding. Another, over a small stream, say averaging 8 feet high, new and good, 176 feet long.

Near Chicka-  
saw.

Then another, 8 or 10 feet high, containing 7 bays, 16 feet; same style. At the time of the inspection, for many miles along this part of the road there was fresh ballast by the roadside, and numerous gangs of men, from 8 to 16 in a company, at work.

One mile  
south of  
Chickasaw.

Here is a trestle, 7 or 8 feet high, and 7 bays of 16 feet each, and good.

Near Versail-  
les.

Just north of Versailles is another new trestle of the same general description as the last.

Condition of  
the track.

For miles, thirty or forty, along here the track is in very good condition. The road is ballasted with gravel.

Trestles.  
Versailles.

Then follow two similar trestles, from 40 to 60 feet long.

There is a double bridge at Versailles, each span 42 feet long, with 4 panels, Pratt pattern. The end struts are 9 by 15 inches; the center ones, 6 by 12 inches. There is a short brace against the middle of the end strut. The rods are  $1\frac{1}{2}$  and  $1\frac{3}{4}$  inches. The lower chord has two pieces, 7 by 15 inches. Floor beams, 7 by 14 inches, and 4 to a panel. Stringers, 8 by 10 inches. Lateral braces, 6 by 6 inches. The piers are double frame bents. The north approach has 4 bays, and the south, 2, of 16 feet each; like the others, and about 15 feet high.

4 miles from  
Covington.

Three bays over a small stream running into the Stillwater, of like build. Next, 150 feet of trestle, on frame bents, except 6, which are stone. The highest point is, probably, 15 feet high. Floor and ribbons good.

Stillwater  
creek.

Four panels; total, 45 feet. Pratt pattern, with sloping end struts, 6 by 12 inches, and center braces, 5 by 12 inches; rods, from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. The chord has two pieces, 6 inches wide and 14 inches, and 10 inches deep, respectively. Floor beams, 6 by 12 inches, and 4 to a panel. Track-stringers, 8 by 9 inches. Floor, 4 by 6, at intervals of 6 inches; rather light, ribbons in like condition.

Trestles.

Next there is a small trestle of 6 spaces, each 16 feet, and then not far away another of three spans, like those before described.



Then another of 9 spaces, about 10 feet high, and cross-braced; and one of 5 spaces, say 10 feet high. Do.

Frame trestle; 29 feet high at highest point, and has 26 spaces, 16 feet each, and cross-braced. Caps, 12 by 12 inches. Stringers, 12 by 14, with an additional one, 6 by 14. Floor and ribbons light; the latter bolted at 6 feet intervals. The longitudinal braces are replaced by others, which are sloping in the direction of the road; an X bracing in alternate panels. Ludlow creek.

Another of like height as the preceding, has 15 spaces, and is over the fore-bay of a mill, and over the road. Next are three or four others, from three to five spaces each; then one of 6 spaces, of similar construction. Trestles.

Then follow two spans, precisely the same as those over the Still-water, having a north approach of 3 spaces, and a south one of two, all as usual. Then two more, one on each side of the Pan Handle Railroad, 6 miles from Dayton, of 2 and 3 spaces, respectively. Bridges and trestles.

### 3. Southeastern Division, from Dayton to Chillicothe.

There is a low trestle, 120 feet long over the hydraulic; good.

Another similar one, 100 feet long, and strong.

Another, 100 feet long; same kind.

There is a skew bridge set at so great a slope, that the west end of the south truss is very nearly opposite to the east end of north one. The timbers are sufficiently strong; the lower chord is a single piece, 12 by 14 inches; the upper, 10 by 12 inches; the end struts, 9 by 12 inches; the main braces, 4 or 5 by 12 inches; the rods, 1½ and 1½ inches. Six panels; total length, 48 feet. Dayton. 2½ miles from Dayton. Harbines. Gravel pit near Xenia.

The west approach is by a trestle 180 feet long, and sufficiently strong.

Short trestle of three spaces; say 30 feet total, and good.

Another of the same size.

Three spans, each 20 feet. Not high, but good.

Another of the same size.

Another of 4 spans, 20 feet each. All good.

Are two more; one of three, and one of four spaces, each 20 feet. The latter is about 15 feet above ground over a roadway. Near by.

Here is a trestle of 40 spans, each 20 feet; total, 800 feet. The highest part is 32 feet above the bed of the creek; for half the distance it averages about 20 feet. Stringers are 12 by 16 inches; corbels, 12 by 12 inches, and 8 feet long. The ties are 6 by 7 inches, and 22 inches asunder from center to center. The guard rails, 5 to 6 inches, and about half bolted; the caps on the piles are 12 by 12 inches. The tall piling is braced by two sets of diagonal transverse braces; the remainder by one set. Caesar's creek.

The trestle is sufficiently strong, but is not good in case of derailment.

A low, good trestle, 3 spans; total, 60 feet.

Another of the same size.

A skew frame trestle of 7 spaces, 20 feet; total, 140 feet. It is about 12 feet high on the average; it is rather old; one bent has been reinforced, but I think the structure is safe for another year.

Trestle, 3 spaces, 20 feet; 60 in all.

Another of the same size, and 8 or 10 feet high.

Another of the same size.

Another of the same size.

1 mile further.  
28th mile post from Dayton.  
Little Caesar creek.

Jamestown.  
½ mile east.  
1 mile further.  
N. Allentown



East of Allentown, small stream.	Another of 5 spaces, 100 feet total ; 6 or 8 feet high.
1 mile east Cunninghamham.	Pile trestle, 10 feet high ; cross-braced ; 120 feet long.
Nr. Wash'ton.	The length of the bays is 20 feet when not specially given.
In Wash'ton.	Trestle, four spans ; total, 80 feet.
do	Another, 12 feet high over Paint creek ; 140 feet in length.
do	Two spans, 20 feet, over street.
North fork of Paint creek, same stream.	One of 220 feet total length, 10 feet high, and on a skew.
4 miles from Washington.	Pile trestle, cross-braced ; 15 feet high, and 200 feet long.
5 miles do	Dry bed of a stream ; a trestle, 60 feet long, 10 feet high ; made well.
6 miles do	Farm road, 80 feet.
55th mile post from Dayton.	Pile trestle over a small stream, 5 spaces, 20 feet each ; 100 feet.
57½ miles.	A good pile trestle, 15 feet high, and 100 feet long.
58 miles.	A trestle, 60 feet long, from 8 to 10 feet high ; over a small stream,
58½ miles.	across which the road passes 7 or 8 times in a short distance.
59 miles.	60 feet trestle, and near by another of the same size.
	Three, each 60 feet, and near to each other.
	40 feet trestle, 10 feet high ; near by, another, 60 feet long, and 10 feet high ; and again, near by, one of the same length, and 12 feet high ;
	also, a 60 feet ; one, 40 feet ; another, 60 feet ; all 8 or 10 feet high, and cross-braced.
North fork of Paint creek.	Another, 140 feet long.
Second time.	West approach, 60 feet ; east, 40 feet ; also 2 trussed girders, having
	two 2-inch rods on each side ; and the bridge is in process of renewal.
North fork of Paint creek.	60 feet trestle, and near Austin station, another, 40 feet long.
1 mile east of Frankfort.	Frame trestle, 60 feet ; and half a mile further on, a pile trestle, 80 feet long ; and 2 miles from Musselman's, another of 60 feet.
Musselman's.	100 feet frame.
72 mile post.	100 feet frame.
72½ mile post.	80 feet, and one, 60 feet over Paint street, at the extreme south side
74th mile post and Paint Str.	of Chillicothe.
Chillicothe.	
	4. South-eastern Division, from Wellston to Chillicothe.
	The remainder of the road was examined, commencing at Wellston, and coming westward ; and the structures are numbered in order, westwardly.
General statement.	The flooring is 4 by 8 inches, and placed at 4 inches interval ; the stringers, 12 by 14 inches ; ribbons, 6 by 6 inches, and notched. All the bents are frame, except when otherwise stated ; the timbers being 12 inches square, new and good. The bays are 16 feet.
Trestles	
Nos. 1, 2 and 3.	One 80 feet long, and 15 feet high ; next, 144 feet long, 15 feet high ; next, 80 feet long, 10 feet high.
Nos. 4 and 5.	No. 4 is 128 feet long, and 10 feet high ; No. 5, 80 feet long, 8 feet high.
Nos. 6, 7, 8, 9 and 10.	Each 64 feet long, and 7 feet high ; except No. 9, which is 6 feet.
Nos. 11, 12 and 13.	Each 64 feet long, and 8 feet high.
Nos. 14, 15, 16, and 17.	Nos. 14 and 17 are each 64 feet ; Nos. 15 and 16 are 48 and 80 feet, respectively ; and all 8 feet high.
Nos. 18, 19 and 20.	Nos. 18 and 19 are each 64 feet long, and 8 feet high ; No. 20 is 80 feet long, and of the same height as 18 and 19.
Nos. 21 and 22.	No. 21 is 48 feet long, and 6 feet high ; No. 22 is 80 feet long, and 7 feet high.

No. 23 is 80 feet long, and 8 feet high; and No. 24 is 112 feet long, Nos. 23 and 24. and 10 feet high.

Howe Truss, new; 12 panels,  $10\frac{1}{2}$  feet each; 14 feet wide, 22 high, Salt creek. clear. Rods are in threes, from  $1\frac{1}{2}$  to 2 inches. Main braces, from 6 by 10 to 9 by 10 inches; the counters, all 6 by 8 inches. The chords contain 4 pieces, 6 by 12 inches, and 6 by 10 inches, respectively. Floor beams,  $6\frac{1}{2}$  by 14 inches, and 5 to a panel; stringers, 10 by 12 inches; floor, as on the trestles. The abutments are double frame bents; the east approach is 48 feet, the west, the same length.

48 feet long, 15 feet high, over a small tributary of Salt creek; one, Trestles. 48 feet long, and 10 feet high.

East approach, one bay, 16 feet; then three trussed girders, having Salt creek. double 2-inch rods on each side; and double stringers, 8 by 15 inches. The rods deflect 5 feet below the bottom of the stringers. There is frame support on piles. The floor is unfinished, but soon will be completed.

Howe Truss, 14 panels,  $10\frac{9}{16}$  feet each; 14 feet wide, 22 feet high. Salt creek. The rods are by threes, ranging from  $1\frac{1}{4}$  to  $2\frac{1}{4}$  inches. The main braces, from 7 by 11 to 9 by 12 inches; the counters, 7 by 8 or 7 by 10 inches. The lower chord has 4 pieces, 7 inches wide, and 15 inches deep; the upper is 13 inches deep. The floor beams are 7 by 14 inches, and 5 to a panel. The west approach has 2 bays, each 16 feet, and one trussed girder, like other such named above. The piers are double framed, and stand on piles; near by is riprap, to protect the banks.

Next comes a 64-foot trestle over a road, at a height of 10 feet, and Roadways another, 48 feet long, 10 feet high; one over a gully, 48 feet long. and gully.

Then a trussed girder, of the same size as the preceding similar More, and structures, having the same length of stringers as an approach at the ends. more trestles. One, 48 feet over a small gully; one, 80 feet over the bed of a stream, and is 14 feet high.

East approach contains three bays, 16 feet each. The bridge has 3 Scioto river. spans of 14 panels, each  $10\frac{9}{16}$  feet long; width, 14 feet; height, 22 feet in the clear. The timbers are of the same size as those of a bridge of equal length of span over Salt creek, above given. Then follow 31 bays of 16 feet each, on piles cross-braced; but the flooring pieces are short, 4 by 8 inches, and there are no ribbons. The east *abutment*, so to speak, is frame, but the west one shows first class masonry.

Then follows another equal span of like construction. The east abutment is first class masonry, the west one is a double frame bent; the banks are ripped.

This road from Dayton is pretty well ballasted, and mostly fenced.

There is a small, simple swing bridge over the canal, which needs Canal bridge no further mention here. at Chillicothe.

5. Allentown branch, from Allentown westward to New Burlington.

From Allentown, above-named, a branch road extends to New Burlington, about 10 miles south-south-east of Xenia. The examination of structures was commenced at New Burlington.

Sixteen spaces, 20 feet each—320 feet; 35 feet at highest point. All No. 9, Burlington. the trestles on this road are of one kind, that usual for such structures. ton. [Note book 3, p. 19.] Frame timbers, 10 inches square. Corbels, 12 by 12 inches, and 8 feet long. Stringers, 12 by 14 inches. There are no guard rails, and the ties, which were originally at 2 feet intervals, are "bunched" at several points on the work. One stringer is bad.

Amount of traffic.

But this trestle is near the end of the road, and only few trains pass over it, and these all light. Wherefore the risk is small.

No. 8, 1 mile east of Burlington.

Four spaces, 20 feet each. All the spans are 20 feet on this road. In all essentials like No. 9, except there are 4 by 4-inch guards, insufficiently fastened, and of no account.

No. 7,  $\frac{1}{2}$  mile further east.

120 feet long. The west approach is a span, 14 feet long, and the stringers are round cherry logs, 1 foot in diameter. These are much decayed, and are unsafe.

No. 6,  $\frac{1}{2}$  mile west of Mt. Pleasant.

100 feet; 18 feet high; of same general build.

No. 5, near Mt. Pleasant, on the east.

360 feet long, and 40 feet high at the highest point. Ribbons extend only half way. At the highest point, 4 longitudinal, and two cross stays, half way up.

No. 4, near last.

180 feet; 25 feet high. The ribbons are entirely wanting at the west end; those in place are notched, are 18 feet long, and held by only two bolts, and, of course, have little or no value.

No. 3 $\frac{1}{2}$ ,  $\frac{3}{4}$  m. east of Mt. Pleasant.

Roadway, 80 feet; 14 feet high, like the others.

No. 3,  $\frac{1}{2}$  mile west of Port William.

180 feet; 25 feet in highest place.

No. 2, Port William.

180 feet; 12 feet where highest; over Caesar's creek. Two bents near the center of the creek are very much injured by flood and ice; and two additional ones. Temporary supports have been added; but as the central part of the trestle is deflected 2 feet out of line, and there are no guard rails, the structure, without there is very great care, will cause disaster.

No. 1,  $\frac{1}{2}$  mile east of No. 2.

72 feet; 12 feet high over rivulet; 4 longitudinal pieces bolted to the bents.

The only ballast to speak of on this road is found in or near the cuts, and there is little or no fencing, and no care is taken of the road bed itself, if one may judge from appearances.

## V. SCIOTO VALLEY.

### 1. Bridges from Columbus to Chillicothe.

No. 5, Howe Truss.

Near Rees's Station; consists of two spans of ten panels each; the entire length being 240 feet; clear width, 14 feet; and height, from center to center of chords, 21 $\frac{1}{2}$  feet. The outside wooden guard rails or ribbons are very much warped, and out of line, and are bolted at irregular intervals of 8 or 9 feet. There are no inside guard rails, either on this bridge or on any other, so far as the road has been examined. Means of safety being thus wanting, in case a loaded car, or locomotive should be derailed on the bridge, disaster is certain to follow. Eight of the cast iron chord blocks, against which the braces abut, are crushed, and, of course, thereby still further weaken the originally weak structure.

Two road beams and several ties are badly decayed. The bridges on this are not covered, and are 6 or 7 years old. The bridge sinks under a locomotive to the extent of two inches, as well as I could judge by the eye, and sways laterally far too much for a safe bridge.

For the dimensions of the separate parts reference is made to the book of plans and descriptions herewith submitted. The track-stringers are double, and are of pine, 5 by 10 inches, and resting on road beams

which are too far apart, especially when the beams are 14 feet between supports.

Over the canal at Lockbourne; length, 100 feet; width, 14 feet; height,  $21\frac{1}{2}$  feet; measured in the usual way; similar to No. 5, except the timbers are smaller. It is reached by trestle work on each side; the north trestle being 180 feet, and the south 150 feet long, and all are embraced in a curve of a radius of 1,500 or 2,000 feet. The rails of the curve are not regularly bent, some of them are nearly straight, and others bent to a radius much smaller than those above given, wherefore it was difficult or impossible to find out by measurement what the intended radius is. No. 7, Howe Truss.

The ribbons are loose in many places, and rotten in others. They would offer no appreciable resistance in case of derailment of a train. A passenger train crossed while I was on the bridge. It bent downward, and swayed laterally as if ready to fall on a little more provocation. The trestle at the south end behaved similarly, although not to so great an extent.

The bridge timbers are the smallest which I have found anywhere.

The ties on trestles and bridges should not leave open spaces over 3 inches wide, or four at the greatest; but here they are *twelve*, and consequently would be broken or knocked entirely out of place at the first shock of a loaded car or locomotive. Besides, several of them are much decayed, so as to offer only a slight resistance against the spreading of the track under a locomotive. Two or three of them I picked nearly asunder in a couple of minutes.

Near Ashville; two spans, each 100 feet; of the usual width and height—and *weakness*. The end posts are only 6 inches square, and being pine, and 20 feet long, they would serve better for bean poles than for bridge posts. Bridge No. 9, Howe Truss.

There are two broken castings in the north span. On the trestle approach at the south, one rotten tie I *kicked* entirely off the structure, and with the spud I picked three-fourth of the way through two others.

The lateral and vertical motion of the bridge under the weight of a locomotive is very great. I stood on the middle of the north span, which is the weakest, in order to see; and speak therefore from positive knowledge.

Over the Scioto at Chillicothe; has three spans of 150 feet each, of the usual height and width adopted on this road. In one of the spans, 8 castings are broken; in another, 9; in the third, 11, making 28 crushed castings in the bridge. All these are on the lower chord. It was impracticable at the time of my visit to examine the castings of the upper chord. No. 37, Howe Truss.

## 2. Trestles, from Columbus to Chillicothe.

Roadway near Columbus; 116 feet total. The panels vary from 10 to 16 feet. Stringers, 12 by 14 inches. Ribbons,  $4\frac{1}{2}$  by 8 inches, notched. Ties, 5 by 10 inches, and 1 foot apart. Corbels, 6 feet and 12 inches square; about 15 feet high. There is a trussed girder, say 30 feet long, with 3 chord pieces, 4, 8 and 4 inches wide, and 14 inches deep, and 2-inch rods on each side. No. 1.

80 feet; similar to the preceding.

No. 2, Columbus.

- No. 3, Columbus. 176 feet long, 13 feet high. There are no guard rails, and consequently the ties are considerably bunched. Otherwise good. It is new.
- Trestles in connection with bridges. Book 1, page 18. Rees's Station. The north approach is 180 feet long, and about 10 feet high on the average. The south approach, at Lockbourne, is 160 feet, and is about 9 or 10 feet high (see book 1, pages 16 and 17, etc.). The north approach, 180 feet; about 9 feet high.
- No. 15, small stream. 15 panels, 16 feet each on curve: 4 or 5 on piles; remainder, framework. From 6 to 12 feet high. Timbers, 12 inches square; outer guard rails good; inner defective.
- No. 17. Six bays; total, 90 feet; on piles; strong; but guard rails without bolts.
- No. 23. 175 feet long, from 6 to 10 feet high; on timber sufficiently strong; the ties average 15 inches apart.
- No. 30. Over small stream. Ten bays; total, 150 feet; all good, except the ties are too far asunder.
- No. 34. 100 feet long; of which 25 feet are in a trussed girder, 9 by 14 inches, with two 1½-inch rods on each side. Ties as before. Abutments stone.
- No. 35. 180 feet; of usual sized timbers. Ties, 6 by 10 inches, and 1 foot apart. Half the trestle is 24 feet high, having double or two story frame bents, well strengthened by longitudinal crossed braces; all good.
- No. 36. North approach to the Scioto river bridge; about 2000 feet long; in fair condition.
3. Main Line, from Chillicothe to Portsmouth.
- No. 38, second Scioto bridge. Howe Truss, three spans, 150 feet each; 14 panels; width, 14 feet; height, 21½ feet. The main braces range from 6 by 12 to 11 by 12 inches; ends inclined; counters, 7½ by 8 to 7½ by 9 inches; lower chord, four pieces, two 6 and two 7 inches wide; all 14 inches deep; the upper chord is 11 inches deep; the rods are by threes, and range from 1½ to 1¾ inches; road beams, 6 by 12 inches, and 2 feet apart. Abutments and pier of wood; pier is of piles. The south approach is a good 75 feet trestle. The north approach has 23 bays of 15½ to 16 feet, then a 20 feet span, and a trussed girder 32 feet long, having 3 beams on each side, 12 by 20 inches, and two 2½-inch rods, then 22 pile spans, firmly cross-braced and 22 feet high to the top of the rail. The whole trestle work is very good.
- No. 39, canal bridge. Slightly over 100 feet; 10 panels; width and height as before. Lower chord has 4 pieces, two 5 and two 6 inches, all 14 inches deep; upper chord, 11 inches. Main braces range from 6 by 10 to 13 by 10 inches, inclined; counters, all 7 by 8 inches; rods, from 1 to 1½ inches; ties, 12 inches apart; double track-stringers, 5 by 10 inches; road beams, 6 by 14 inches, and 2 feet apart. The pile abutments are good.
- South compared with north end of road. There is a 60 feet trestle at the south end, all good. In fine, all the structures south of Chillicothe are newer and far better than those north of that city, and the road itself is in far better condition.
- No. 40. Thirteen bays of good piling, about 20 feet high. All guard rails on this end of the road are 4 by 9 inches; ties, 5 by 6 to 10 inches, and 1 foot asunder, at least.
- No. 42. Eleven bays; good, strong pile trestle.
- Nos. 50 to 54. Pile trestles, from 45 to 100 feet long, all strong.
- No. 60. Ten bays of the same kind.
- No. 62, canal bridge. A counterpart of 39, in all respects.

The south approach has 13 frame bents and 45 pile bays, together, over 900 feet long, from 10 to 20 feet high, and all good.

Three spans, 11 panels each, and 14 feet long each; width, 14 feet; No. 65, Pratt. height, 22 feet. The top chord has 4 pieces, two 6 and two 7 inches wide, all 12 inches deep. End struts are a continuation of the top chord, so to speak. The posts are double,  $6\frac{1}{2}$  by 8 inches, 8 by 10, and 10 by 12 inches. The three counter bars are 1,  $1\frac{1}{4}$ , and  $1\frac{3}{8}$  inches square, respectively. These bars, main suspension from the center outward, measure  $1\frac{3}{8}$ ,  $1\frac{1}{2}$ ,  $1\frac{3}{8}$ , and  $1\frac{1}{4}$  inches, are double and attached in the usual way in this form of bridge. The road beams are triple, 5, 6, and 5 inches broad, and 16 inches deep, hung on stirrups. The stringers are in sets of three, 6 by 12 inches. In the double panel at the end, the lower chord consists of 2 bars,  $3\frac{1}{2}$  by 1 inch; in the next panels are 4 bars,  $3\frac{1}{2}$  by  $\frac{3}{4}$  inches; in the 4th panel, 4 bars,  $3\frac{1}{2}$  by  $1\frac{1}{8}$  inches; in the 5th panel, 6 bars,  $3\frac{1}{2}$  by  $\frac{7}{8}$  inches; in the middle panel, 6 bars,  $3\frac{1}{2}$  by 1 inch. The north approach consists of 70 bays of 16 feet each, piling from 10 to 15 feet high. The south has 12 bays of the uniform length, at the highest point 22 feet high, and there strongly double braced.

Fifteen bays, from 10 to 15 feet high, on piles, cross-braced and No. 77. strong.

Eight bays, 10 to 15 feet high, piles strong.

No. 78.

From 4 to 6 bays, on braced piling, all good.

Nos. 79 to 82.

Thirteen bays, part frame, part pile, very good.

No. 84 (88 m. from Col'bus.)

From 4 to 6 bays, all good. Numbers not given; are mere cattle

Nos. 85 to 89.

passes.

Twenty-three bents, or bays, rather; piles, highest point 25 feet, with No. 94.

3 sets of double braces.

The first, 7 bays, the second, 19 bays, 10 feet high, on piles, and Nos. 95 and 96. braced.

Eight bays, 15 feet at highest point.

No. 98.

Eight bays, piles, braced; twenty-five feet in highest part; the two Nos. 101 & 102. alike.

Four bays.

Nos. 103 to 105.

Eight bays, frame, all good.

No. 106.

Eight bays, highest, 31 feet; frame. Two bays are double braced, No. 108. and longitudinal braces are put in.

Four bays.

No. 109.

Same as 108.

No. 111.

At the Portsmouth yard, three trestles side by side.

No. 11.

Seven, light; to be immediately replaced (Aug. 1881).

No. 117.

#### 4. Branch, from Portsmouth via Sciotoville to Ice Grove.

Eleven; flooring, 6 by 10, at 10 inches interval; ribbons, 5 by 9, full No. 118,  $5\frac{1}{2}$  m. bolted; height, 10 or 15 feet. from Portsmouth.

Six; of these one is frame, 3 pile, and two, frame standing on piles. No. 119. The greatest height is 43 feet. The upright pieces have two sets of transverse horizontal braces, and also inclined transverse braces, also longitudinal and inclined braces in the direction of the road. This is a good piece of work.

Howe Truss, with inclined end posts of 14 panels, each  $15\frac{3}{4}$  feet; No. 119. width, 14 feet; clear height, 21 feet. Main braces range from 6 by 11 to 9 by 12 inches; counters,  $7\frac{1}{2}$  by 9 inches; rods in threes, from  $1\frac{1}{4}$  to 2



- inches. Lower chord, two 6 inches, two 7 inches, pieces all 14 inches deep; upper chord, 11 inches deep; road beams, 6 by 14 inches, 21 inches apart; lower laterals, 6 by 6 inches, and rods  $1\frac{1}{2}$  inches; track-stringers, double, 5 by 10 inches; floor, 6 by 10 inches, and 12 inches apart; ribbons, full-bolted, 6 by 8 inches. On the east is an approach of 30 feet on trestles, less all than one year old, all good.
- No. 120. Thirteen bays, 10 to 15 feet high, of 11-inch lumber, all good as is made.
- No. 121. A short, secure trestle.
- No. 122. Twelve bays, say 20 feet at highest point; cross-braced as usual; new.
- No. 123. Eight bays, 10 to 15 feet high, new and solid.
- No. 124. Twenty-nine bays, 14 on braced piles, 13 frames on piles, and two frames; 24 feet at highest point; cross-bracing is bolted to the caps.
- No. 125. Twenty-one bays, of which two are frames, 13 piles, and 6 frames standing on piles. Longitudinal cross-braces, as in 124, also transverse bracing. Then, a modified Howe of 10 panels; height, 20 feet; width, 14 feet. Main braces range from 7 by 10 to 9 by 10 inches; the counters, 6 by 7 to 7 by 8 inches; floor beams, 6 by 14 inches, and 24 inches apart; vertical ties are by threes, from 1 to  $1\frac{1}{2}$  inches; chords, 2 fives and 2 sixes, 14 inches deep; frame abutments on piles. At the east side is an approach of 7 bays, one frame on piles, 2 piles, and 4 frames. At the end next the bridge it is about 20 feet high. It is braced transversely and longitudinally.
- No. 126, Franklin Furnace. Sixteen bays, from 15 to 20 feet high, new and strong.
- No. 127, Hanging Rock. Eleven bays. There are 3 bays, having 3 beams of 6, 9 and 6 inches width, and 16 inches deep.
- No. 128, also Hanging Rock. Another of same size and build; guard rails fully bolted.
- No. 129, also Hanging Rock. Twelve bays, like all the rest, good. Thirty feet at the highest point.
- No. 130, Storm's creek. Fifteen bays, 20 feet at highest point; braced as others along this line; one trussed girder of 20 feet, 3 pieces on each side.
- No. 131, Rachel creek. Same as preceding, except the highest point is 30 feet, but no girder.
- No. 132, Ice creek. Twenty bays, 10 of braced piles, 10 frame bents on piles, vertical posts, 13 inches square; 20 feet at highest point; the long piles are double-braced; there are also 4 longitudinal string braces, and inclined braces in the same direction. All these trestles are first class.
- No. 133. Then, 2 trussed girders, 30 feet each, with corbels 4 feet, and then stringers, 6, 9, and 6 inches, respectively, and 16 inches deep, having two 2-inch rods on a side. Next follow 12 frame bents on piles, then 4 pile bents, braced in the mode usual on this line. The highest point is 40 feet above the water.
- No. 134, Peter's Run. Twenty-two bays, partly piles, and partly frames set on piles, and with the usual bracing.
- No. 135, incline at river, Petersburg. Here are 25 bays, leading down to the landing.

## REMARKS.

South of Chillicothe the road is fairly well ballasted, and in good condition. The fencing is not complete, but the absence of the fence in places is of no special significance. The portion from Sciotoville to the



crossing of the river is new, and as yet only slightly ballasted in places, but the road is well laid, and the train made 45 miles per hour for a few miles on the return.

#### VI. SPRINGFIELD SOUTHERN (Ohio Southern) RAILWAY.

##### 1. From Greenfield to South Charleston.

This road was originally a narrow gauge, but was changed to the common standard, without change of ties, except that about every eighth tie was replaced by one of requisite length. The track from Jeffersonville to Solon is particularly bad. Trains on this part of the road make but 10 or 12 miles an hour. The original iron weighed, say 35 lbs. per yard, but it is now being replaced with iron of 60 or 65 lbs., on ties of proper length, and the road bed is under proper improvement in width. The new rails are down (July 2) to a point two miles south of Charleston; the new iron and ties are distributed all the way to Jeffersonville. The conductor informed me that the road was rebuilt the whole way from Springfield to South Charleston, and that there were no bridges on that end of the route; it was thought best not to examine that part of the road. The two miles of re-constructed road, which I examined, are in first rate condition.

I examined 23 trestles on the road, all good, and all unnecessary. They should all be replaced by earth. They range from four to ten feet in height, and occupy many hundred feet of the way. They can be accounted for on the supposition that wood was abundant and earth scarce.

Triangular truss of 12 panels, each 13 feet, total 156 feet; height, 19 feet; width, 13 feet. Main braces range from 7 by 8 to 10 by 12 inches; counters, from 7 by 5 to 7 by 9 inches; suspension rods in threes, from 1½ to 2 inches; lateral braces, 5 by 5 inches; the upper chord is quadruple, 5 by 11 inches; pins, 3 inches; road beams, double, 8 by 16 inches; ribbons, 6 by 6 inches, and bolted at intervals of, say 6 feet; the lower chord at the end panel, has two bars 4 by ¾ inches; the next, 4 pieces, 4 by ¾ inches; the next, 4 pieces, 4 by 1 inches; the next, 4 pieces, 4 by 1½ inches; the next two panels, 4 pieces, 4 by 1½ inches; the abutments are good; the east approach is 105 feet, the west, 226 feet, on piles, with heavy caps, but with irregular spaces; average, 8 feet.

No. 60, Paint creek.

Howe Truss; 14 panels, each 11 feet; height, 19 feet; breadth, 12 feet. Upper chord, 4 pieces, 6 by 12 inches; lower, same size in thickness, but 14 inches deep. Floor beams, 6 by 14 inches, 33 inches apart; floor, 6 by 8 inches, 21 inches apart. Lateral brace, 6 by 6 inches, and lateral tie rods, 1½ inches. The main braces vary from 6 by 10 to 9 by 11 inches; the counters from 5 by 8 to 8 by 8 inches. Suspension rods are in sets of three, and range from 1½ to 2½ inches. The track-stringers are 5 by 12 inches, and double. Approaches at each end, 30 feet, on piles well supported. The abutments are piles from 12 to 16 inches diameter. Three rows of piling, five or six feet apart, capped with 12-inch oak timber. Ribbons, 6 by 6 inches, bolted at the fifth tie. Piles stiffened by cross-braces well bolted.

No. 53, Paint creek.

This bridge is too narrow for standard gauge cars. The lateral sway-Remark.  
ing motion of cars may cause them to be hurled against the end of the

bridge, in which case the structure would be knocked to pieces. At some time the sway has been so large as to cause a car to graze the timbers on one side.

- No. 51. 45 feet trestle; three bays, 6 feet high. The trestle work on this road is all good, without exception.
- Nos. 49 and 48. Low trestle, 60 feet long; another 100 feet long.
- Nos. 47 and 45. 47 is like 48, and the other is 45 feet long.
- Nos. 44 and 43. 44 is like 45; and 43 is 30 feet long, and 4 feet high; a mere *culvert*.
- No. 42. 350 feet long, and 10 feet high.
- No. 41. 300 feet long, and 8 or 10 feet high.
- No. 40. 120 feet long, 10 feet high, over creek, ten-inch timber.
- Nos. 39 and 36. 39, same as 40, except it is 8 feet high; 36 is 100 feet long.
- No. 34. A copy of 36.
- Other numbers omitted represent mostly mere cattle passes.
- Remark. Further particulars will be also found in note book 1, pages 14 and 15.

## 2. From Greenfield to Jackson.

- No. 62, Greenfield. 200 feet; all good.
- No. 63, 1 mile away. 500 feet long; 25 feet at greatest height. Stringers, oak, 12 by 14 inches; floor, 6 by 8 inches, and 10 inches interval; corbels, 6 feet; ribbons, 6 by 6 inches, bolted at intervals of 4 feet. There are horizontal braces in both directions, transverse and longitudinal, and double sets where the trestle is high.
- Nos. 67 and 68. The former 100 feet, the latter 50 feet low, and made in the usual way.
- No. 70, Buckskin. Howe Truss; 120 feet, 12 panels; 19 feet clear height; width, 12 feet. Main braces, from 6 by 9 to 11 by 11 inches, sloping end posts. Counters, 6 by 6 to 6 by 9 inches. Rods, in pairs, from  $1\frac{1}{4}$  to  $1\frac{5}{8}$ , and threes from  $1\frac{5}{8}$  to 2 inches. Lower chord, four pieces, 5 inches broad, and 12 inches deep; upper, 10 inches. Floor beams, 6 by 12 inches, and 2 feet apart. There are good iron clamps on the chords. Track-stringers are 6 by 9 inches, and double. The bridge is painted, and probably injured thereby. These are good stone abutments.
- No. 75, Buckskin, 3 miles from Bainbridge. Howe Truss; 14 panels, each 11 feet. Height, 19 feet; width, 15 feet. Track curved. Bridge painted. Main braces, from 6 by 10 to 11 by 13 inches, inclined end posts. Counters, 6 by 7 to 8 by 8 inches. Chords, four 6-inch pieces; 14 inches deep in the lower, 12 inches in the upper. Track-stringers, 6 by 12 inches, and double. Lower laterals, 6 by 6 inches. Tie rods,  $1\frac{1}{2}$  inches. Floor beams, 6 by 14 inches, 2 feet apart; floor, 6 by 8 inches, 10 inches apart, 10 feet long. Ribbons, 6 by 6 inches, notched and bolted. The suspension rods in two places are in pairs,  $1\frac{1}{8}$  to  $1\frac{1}{2}$  inches; in five places in sets of three, from  $1\frac{3}{8}$  to  $2\frac{1}{8}$  inches. Iron clamps are used on the lower chord. The masonry is first class.
- No. 76, Paint creek, Bainbridge. Howe Truss; 12 panels,  $10\frac{7}{10}$  feet each. Main braces, 6 by 9 to 10 by 11 inches, with inclined end posts. Two equal spans. The counters run from 6 by 6 to 6 by 7 inches. The suspension rods at 3 joints are in pairs, and range from  $1\frac{1}{4}$  to  $1\frac{5}{8}$  inches; at the remaining 3, they are by threes, from  $1\frac{1}{2}$  to 2 inches. Lower chord, 4 pieces, 6 by 12 inches; upper, 6 by 11 inches. Floor beams, 6 by 12 inches, and 4 to a panel. Bridge is painted. The bridge is 19 feet clear height; 14 feet wide. Remaining parts as before. The north abutment is first class masonry.

the pier and the south abutment have three rows of piles, 14 inches diameter, on which is a heavy set of timber. The abutment and pier will shortly (August, 1881) be replaced by masonry.

340 feet of trestle (pile). There are 10 feet corbels at alternate bents; No. 77. track-stringers, 12 by 14 inches; with the usual floor.

1200 feet of pile trestle; 16 feet at the highest point. Sway, horizontal, lateral braces are employed. There is the usual floor. Bays are 10 feet, having had the lengths changed by the process of putting in an extra set of piles. No. 78.

Howe Truss; two equal spans; 12 panels,  $11\frac{3}{10}$  feet; width, 14 feet; height,  $19\frac{6}{10}$  feet. Stone abutments and pile pier. Main braces, 6 by 9 to 11 by 12 inches. End pieces sloping. Counters, 6 by 6 to 6 by 8 inches. Lower chord, 4 pieces, 6 by 12 inches; upper, same, by 10 inches deep. The suspension rods are in sets of three, ranging from  $1\frac{1}{2}$  to 2 inches. The floor beams are 6 by 14 inches, and 4 to a panel. Usual flooring, at 12 inches intervals. No. 79. Paint creek, 2 miles from Bain-bridge.

Howe Truss; like No. 79, only about 7 feet shorter; and the inclined pieces at the end are 10 by 11 inches; the smallest suspension rods being  $1\frac{1}{2}$  inches. The west abutment is good masonry; the east abutment and the pier are piles, and the usual timbers accompanying. No. 8, same stream.

Trestle; 10 feet high, 120 feet long, and good.

Trestle; 760 feet long; height, about 15 feet where highest. There is longitudinal bracing as well as transverse. No. 81, 7 miles from Bain-bridge. No. 82.

This road having been changed from narrow to standard gauge, the trestles (which were originally constructed with spaces of 20 feet between the centers of the bents), were re-enforced by the insertion of an intermediate support at the middle of the 20 feet span. The spaces are consequently only 10 feet from center to center; and inasmuch as the timber is foot-square oak, the trestles are the strongest found on any road that I examined. Remark.

Trestle, about 700 feet long, and 18 feet at the highest point. There are the usual transverse and longitudinal braces. No. 84.

Trestle, about 500 feet long, and 16 feet at the highest point. There is double transverse bracing, and the usual longitudinal pieces. No. 85.

The shortest curve found had a radius of 420 feet.

Curves.

A 100 feet low trestle.

No. 87.

Near Summit Station is a boggy hillside, where the track is continually sinking; but it is persistently worked at, and kept in fair condition for slow travel. Remark.

160 feet trestle; about 25 feet at highest point. Construction as usual. No. 91, 6 miles w. of Waverly.

Exactly like No. 91.

No. 92.

700 feet trestle, of which 500 feet are from 25 to 30 feet high; having in this part double transverse and longitudinal braces; on a curve of 1000 feet radius. No. 93.

550 feet trestle, straight; otherwise like 93.

No. 94.

400 feet trestle, about 20 feet high, with single transverse and longitudinal braces. No. 95.

Same as No. 95, in all respects.

Trestle over canal; 3 bays; total, 80 feet. Two of the bents have been re-enforced, but the bridge is not first class. No. 96. No. 97.

No. 98, small stream. Howe Truss; 14 feet wide, 14 feet high; 10 panels, each  $7\frac{1}{2}$  feet. Main braces vary from 7 by 8 to 8 by 9 inches; the counters, from 6 by 6 to 6 by 8 inches. The rods are in pairs, and range from 1 to  $1\frac{7}{8}$  inches. The lower chord has three 6-inch pieces, 13 inches deep; the upper chord similar, with a depth of 11 inches. Floor beams, 7 by 13 inches, and three to a panel. Track stringers, 10 by 10 inches; lower lateral bracing, 7 by 7 inches; ribbons, 4 by 6 inches, notched. Bridge old, and not very good.

Remark. The trestle approach to the Scioto bridge is 1300 feet long, is 22 feet high at the highest point; and the upper timbers, those on the piles, are considerably decayed. Stringers are double, 10 by 12 inches.

Remark. This upper part should be renewed.

No. 99, Scioto river. Howe Truss; 3 spans of 14 panels, 10 feet 10 inches each; width, 14 feet; height, 20 feet. Spans equal, with inclined end pieces. Main braces vary from 7 by 11 to 10 by 12 inches; counters, from 7 by 7 to 7 by 9 inches. Suspension rods are in sets of three, ranging from  $1\frac{1}{8}$  to 2 inches. Lower chord has two 6-inch and two 7-inch pieces, 14 inches deep; the upper has 12 inches. Floor beams, 7 by 14 inches, and 4 to a panel. Track stringers double, 8 by 12 inches; usual floor; and 4 by 6 inches ribbons, notched.

Remark. The east span is fair; the middle span has 17 broken angle-blocks; the west 16. The bridge should be strengthened or renewed; it is not first class by a long way.

East approach, pile trestle. This is 200 feet long, 20 feet high, and braced in the usual manner. There are three stone piers of first class masonry.

No. 100. 150 feet trestle; a good deal decayed; abutments of stone about to be put up.

No. 110. 450 feet. Trestle, 15 feet high; stringers, 8 by 12 inches double; frame bents; good stone abutments.

No. 111. 600 feet. Frame bents on stone foundations, 10 to 15 feet high; condition fair.

No. 112. 120 feet. In essentials like 111.

No. 113. 240 feet. In essentials like the preceding.

No. 114. 36 bays of  $12\frac{1}{2}$  feet each; 450 feet total; on a curve of large radius. Stringers, 7 by 12 inches double, and packed at intervals of 5 feet; the ribbons are 4 by 6 inches, notched; but the bolts are at intervals of 8 feet, and the taps are wanting in 24 places. The piles are from 12 to 15 inches in diameter, and are well braced, as shown in the sketch on page 16, book 3; floor, open.

#### VII. C. C. C. & I., "DAYTON SHORT LINE DIVISION"—CINCINNATI AND SPRINGFIELD RAILROAD, from Dayton to Cincinnati.

No. 24, Miami river, near Dayton. 1871. Howe Truss, 4 spans; total, 620 feet; 14 panels, each  $19\frac{1}{6}$  feet wide, 22 feet high; two ribs, 8 by 24 inches; center main braces,  $9\frac{1}{2}$  by 11 inches; counters, 8 by 10 inches; rods, from  $1\frac{1}{4}$  to  $1\frac{5}{8}$  inches. In general on this road, the floor beams are 7 by 14 inches, at 2 feet interval. Bridge, good.

No. 25. Marked for renewal, and not necessary to give the details.

No. 26, creek. 1871. One span Howe, 98 feet; total length, 108 feet; 14 feet wide, 22 feet high. Main braces, from 7 by 10 to 9 by 10 inches; counters, from 7 by 8 to 8 by 10 inches; rods by threes, from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inches; lower chord has two pieces 5, and two 6 inches thick, and 14 inches deep; the depth of

the upper chord is 2 inches less. Stringers, 10 by 12 inches; ribbons, 6 by 6 inches.

Is a short bridge over the canal feeder; strong and good.

Half Howe Truss; total length, 73 feet; 17 feet wide, 12 feet high; 10 panels, each 6½ feet; mains, all 7 by 9 inches; counters, 6 by 7 inches. Lower chord, two pieces 5 inches, one, 11 inches, and all 12 inches deep; upper, 11 inches deep; track-stringers, 12 by 12 inches; floor beams, 8 by 15 inches, and 2 feet apart; floor, 6 by 8 inches, at 10 inches intervals; ribbons, 8 by 8 inches. All good.

Half Howe Truss; total, 70 feet; width, 18 feet; in all other respects this is a duplicate of No. 28 above.

Same as No. 28 above.

Trestle, 3 bents, 55 feet total; good for a year or two.

Half Howe; total length, 56 feet. In general like No. 28, but smaller.

Same as No. 32, just given.

Howe Truss; total length, 158 feet. Rebuilding a substantial one.

Like 34 in the new form.

Like 33.

Iron girder; Keystone build; length, 55 feet; width, 18 feet; height, 57 feet. Eleven panels. The top plate is 12 inches wide, 1½-inch thick, and properly re-enforced; the stiffening angle irons being of ¾-inch thickness. Floor and ribbons good.

Same as No. 33.

Old, and to be very soon rebuilt, (August, 1881).

Seven short spans, deck; total length, 258 feet. Good.

Pratt; iron; 6 panels, 72½ feet total. Made in the usual way.

50 feet iron plate girder; about as stiff and strong as it is possible to make.

Same as the preceding.

Howe Truss; 98 feet total; to be rebuilt within one year (August, 1881), and measurements, therefore, not here given.

Stone arch.

The road-bed, ditches, fences, ballast, on this road, all in good order.

# VIII. CINCINNATI AND WESTWOOD RAILROAD.—NARROW GAUGE.

Trestle of 16 bays, 20 feet each; total, 320 feet; 35 feet at the highest point. Corbels, 10 by 12 inches, and 10 feet long are used; Posts are 10 by 10 inches; longitudinal inclined braces, 4 by 8 inches in part, and 8 by 8 inches in part; stringers, 6 by 13 inches double; flooring, 5 by 6 inches, at 1 foot intervals; ribbons, 5 by 6 inches, bolted at intervals of 10 feet, but not notched; and would offer no valuable aid in case of derailment.

Similar to No. 1, but is not quite so high; being 30 feet at the highest point, and having 27 bays of 20 feet each, or 540 feet in all.

Ten panels of 12 feet, 16 feet high; like the preceding in size of timber. The guard rails are not bolted, and are useless.

Roadway; two stringers on each side, 7 by 14 inches; and underneath these is a strain beam, 15 by 6 inches.

Fourteen 20-foot spaces, at the highest point, 40 feet; whole length,

No. 27.

No. 28, Miamisburg. 1880

No. 29, Beaver creek. 1878.

No. 30, Crane creek. 1878.

No. 31, Canal waste. 1877.

No. 32, Canal waste. 1878.

No. 33, Pennyroyal creek. 1878.

No. 34, Franklin. 1871.

No. 35.

No. 36.

No. 37, Burnell creek. 1880.

No. 38.

Nos. 39, 45, 46 and 48.

No. 40, Mill creek. 1879.

No. 41. 1880.

No. 42.

No. 43.

No. 44. 1871.

No. 47.

At west end, No. 1.

All trestles on this road, except roadway passes.

No. 2.

No. 3.

No. 4.

No. 5.

280 feet; guard rails are better than those on the other trestles. There is  $\times$  longitudinal double bracing in connection with the strain beams, for  $\frac{1}{3}$  the entire distance.

No. 6. Nine spaces, 20 feet each, or 120 feet in all; 30 feet at the highest point, and entirely similar to the preceding.

No. 7, near the junction. Twenty-four 20-foot spaces, about 20 feet high on an average. The ties are long, the track being on a short curve. This trestle is in process of being filled.

Remarks. The grade in places is very steep; the track quite rough, and out of shape, both in alignment and in surfacing. There is about half enough ballast, and the fencing seems to belong to the owners of the land or lots.

#### IX. COLLEGE HILL RAILROAD—NARROW GAUGE.

Two trestles only on the road. The track is not ballasted, is very steep in places; badly aligned, and badly surfaced; and either not fenced, or the fencing is in the hands of the land owners.

No. 1. Half Howe deck of 7 panels, 7 feet each; lower chord, single piece, 11 by 13 inches; the upper, 9 by 13 inches: corbels, 5 feet long, are used in the trestles; the braces in the bridge are all 4 by 6 inches; the west approach is 127 feet long; in the longest part, longitudinal braces are used; the east approach is 355 feet long, with spans of 15 feet; highest point, 28 feet. The work is all much decayed, and the timber is partly on the ground for renewal.

No. 2, trestle. Length, 188 feet; flooring is 6 by 8, and is bunched very greatly. One bay is 27 feet, having stringers, 14 by 16 inches; re-enforced by a straining beam, 9 feet long, and 5 by 10 inches. Bays in general, 15 feet.

NOTE.—The following letters have been received in regard to the College Hill Railroad:

OFFICE OF COLLEGE HILL RAILROAD CO.,

CINCINNATI, *March 16, 1882.*

HON. H. SABINE, *R. R. Com'r, Columbus, O.:*

DEAR SIR: I enclose herewith a letter, addressed to you, in reference to the condition of the College Hill Railroad.

Can this communication be added to your forthcoming report, so as to do justice to our road? We do not take any exception to Prof. McFarland's report, but feel that it is due the directors that the fact stated in my letter should accompany the publication of his report.

Yours, very truly,

CHAS. R. WILD.

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OFFICE OF COLLEGE HILL RAILROAD CO.,

CINCINNATI, *March 1, 1882.*

HON. H. SABINE, *Com'r of Railroads State of Ohio, Columbus, O.:*

DEAR SIR: I have the honor to acknowledge the receipt of your communication of recent date, containing transcript of report of Prof. McFarland, concerning College Hill Railroad. Referring to some of the facts set forth in the report as to the condition of the road, I would say, that on the 1st of May, 1881, the directors received the



road from hands of former lessee, who had operated the same for three years previous. They found the road-bed in bad condition, the rolling stock needing immediate overhauling, and the trestle-work requiring straightening, by new timbers, etc. They at once addressed themselves to the task of putting the road in good condition. Under the direction of Mr. Wm. Tozzer, bridge builder of the C. H. & D. R. R., the trestle has been made entirely satisfactory, at a cost of near \$1,000. The machinery (locomotives) has had attention at an expense of over \$1,000. The rolling stock has had repairs and addition to nearly \$3,000. A large amount of repairs and labor has been put on the road, in ballasting and alignment of track. 3,000 new ties have been purchased, and are being put in wherever needed, and the condition of the road rapidly brought up to a satisfactory standard. We feel that it is but justice to the company that the facts should be stated as an offset to the criticisms contained in Prof. McFarland's report.

Yours, very respectfully,

CHAS. R. WILD,  
Sec'y College Hill R. R. Co.

# X. CINCINNATI AND NORTHERN RAILWAY.

On this road all the trestle frames are of 12 inches square timber; the flooring is 5 by 8 inches, and at intervals of 9 or 10 inches; and the ribbons are 4 by 5 inches, and notched.

Seventeen bents; highest, 41 feet, three being 2 story frame bents. No. 1, near Norwood.

Horizontal and transverse bracing is used.

To be soon filled, and has no guard rails. No. 2.

Eight bays of 16 feet each, or 128 feet in all; thirty-two feet high; the stringers are 12 by 16 inches, and there are beams under the ends of the ties; bridge very strong. No. 3.

Like No. 3. No. 4.

On a curve, but first class. No. 5.

Total, 160 feet; and at highest point, 28 feet high, and fully braced. No. 6.

Seven 16-foot spaces; fourteen feet at highest point; and on a curve, but good. No. 7.

Same as 7, above given. No. 8.

Two spans of 16 feet each, and 12 feet high; all good; feet high. No. 10 is 10 Nos. 9 and 10.

Like No. 10. No. 11.

Are 3 space trestle; the one 8, the other 10 feet high. No. 12 and 13.

Has 6 sixteen feet bays, and is about 15 feet high. No. 14.

All these have three spaces of 16 feet each, and from 6 to 9 feet high. Nos. from 15 to 19.

No. 20 has 4 spaces, and 21 has three; remainder as usual. Nos. 20 and 21.

Half Howe deck, 10 panels, each 6½ feet; total length, 70 feet; width, 12 feet; height, 10 feet. Rods in pairs, and from 1½ to 2 inches; the main braces and counters range from 4 by 5 to 5 by 8 inches; the lower chord has three pieces, 6 inches wide and 12 inches deep; the other, two 5-inch pieces, one 6-inch piece, all 8 inches deep; floor beams, 7 by 14 inches, at 2 feet intervals; stringers, 10 by 12 inches, and a stringer under each end of the ties. The floor itself is as the preceding ones. The sway braces are 4 by 5 inches. The south approach has 7 bays of 16 feet each, about 18 feet high. The north approach has 9 bays; some of the bents in both approaches stand on stone foundations.



- No. 23, trestle. Three spaces, 16 feet each; good.
- No. 24. Half Howe, 12 panels, 7.3 feet each; height, 7 feet; breadth, 11.3 feet. Rods,  $1\frac{1}{2}$  to 2 inches; main braces, 6 by 8 to 8 by 8 inches, and the counters 6 by 7 to 6 by 8 inches; the upper chord has three pieces, 6, 8, and 6 inches in diameter, and 12 inches deep; the other chord is 2 inches less in depth; foundation, stone; floor as usual. This bridge has 2 bays, 16 feet each, on each side of it.
- No. 25, Lebanon. Howe Truss, 14 panels, 10 feet each. Floor as all of them on this line; width, 12 feet; height,  $19\frac{1}{2}$  feet clear; floor beams, 6 by 14 inches, and 4 to a panel, also end stringers; the rods vary from  $1\frac{1}{4}$  to  $2\frac{3}{8}$  inches. The main braces range from 7 by 9 to 8 by 11 inches; the counters, from 6 by 8 to 7 by 8 inches. The masonry is first class.
- No. 26, trestle. Three spaces, 16 feet each, and 12 feet high; good.
- Remarks. The road is more than half fenced with barbed wire, and the remainder is making ready to be so treated. The road-bed is moderately well ballasted for the whole distance. The road was being overhauled (Aug., 1881.) for alignment and surfacing. The bridges and trestles are strong enough for standard gauge, are all new and all good.

# XI. CINCINNATI AND EASTERN RAILROAD, AND COLUMBUS AND MAYSVILLE RAILWAY.

## 1. C. & E., Walnut Hills Branch.

- No. 1, Little Duck creek—Trestle. Ten panels, each 18 feet, about 20 feet high at the highest point. The stringers are double, 6 by 16 inches. There is one span of 22 feet, where the double stringers are 9 by 16 inches. The floor is 5 by 7 inches, at 9 inches interval. The frame is of 6 by 8 inches timber, and consequently very light. The corbels are 5 feet, the caps of 9-inch timber; these are long sloping transverse braces of small dimensions. The ribbons are 5 by 7 inches, and are notched.
- No. 2, Big Duck creek. Trestle, 18 panels, 18 feet each. The middle has a trussed girder of 40 feet, in which are 3 string pieces, 8 by 16 inches, also 3 rods,  $1\frac{1}{2}$ -inch. It is 47 feet high at the greatest. Along the highest part the frame is two-story; there are four longitudinal braces. The frame timber is 10 inches square in the second story, and 12 inches in the lower. The bents are braced transversely by diagonal pieces.
- No. 3, Lick Run. Thirty-six panels, 18 feet each; bents of 10-inch timber; there is one 40 feet trussed girder, like the one just given; the highest part is 40 feet above the ground. Floor, stringers, etc., like the preceding cases.
- No. 4, a small run. Seven panels, about 15 feet at the highest point; like the others in general build, and is to be filled this year.
- No. 5, valley. Six panels, 15 feet above ground.
- Nos. 6 and 7. Seven panels, 12 feet high; 9 panels, 15 feet high. The last three are to be filled also this year.
- No. 8. Sixteen panels, each 18 feet, and at highest point 19 feet. There is a trussed girder, having 3 stringers 8 by 16 inches, and 4 rods  $1\frac{3}{4}$  inches. Timbers, 8 by 10 inches, all very strong.
- No. 9. Twenty-one panels, 42 feet at highest point; bents, 2-story, of 10-inch timber; the remainder as in the preceding cases. Every third tie is set on edge, and notch on the stringers.
- No. 10, Big Duck creek. Thirty-two panels, usual length, and 52 feet high at the highest point. There is one trussed girder of 30 feet, having 2 stringers and 3 2-inch rods. Other parts as usual in the high trestle work.

Seventeen panels, 40 feet at highest point.

No. 11, at junction of Cincin. & Northern.

## 2. Main Line to Richmond, Batavia Junction.

Howe Truss, two spans; 16 panels, each 9.7 feet; width, 13 feet; height, 21 feet. The suspension rods are by threes, and range from 1½ to 2 inches. The main braces vary from 6 by 10 to 8 by 11 inches, the counters, from 6 by 8 to 8 by 8 inches. The chords have four 6-inch pieces, 13½ inches deep, below, and in the upper, 11 inches. Floor beams, 6 by 14 inches, and 4 to a panel. Lateral braces, 6 by 6 inches. Diagonal tie rods, 1½ inches. The floor is 5 by 7 inches, and 10 inches intervals. Track-stringers, 10 by 12 inches. The pier is made of small-sized blue limestone rock; it was undermined at the north end, and settled two feet, but being built on a strong platform, the stones were not displaced; the south end of the pier was then intentionally undermined, and the pier brought back to its vertical position.

No. 1, Little Miami—1876.

These are pile structures, four at each end, all well braced by block and diagonal braces. The west approach has 3 panels on piles; the east has the same, the stringers being triple. Then follows a trestle 8 feet high, having 12 panels 15 feet. The stringers are 8 by 16 inches on the short panels, and 12 by 16 inches on the long.

Abutments.

Two panels, 18 feet at west end; then two 40 feet trussed girders, having double 8 by 16 inches stringers, and 3 rods on each side; at the east end are 5 panels, a little irregular, on piles; where the panels are longest, the stringers are double. The structure was damaged by ice last winter; it is to be overhauled and repaired. No ribbons; floor, bad.

No. 2, Clear creek.

## 3. Richmond Branch, from Richmond to New Richmond.

Low trestle, 7 feet high; four spans of 20 feet. The posts are set 7 feet deep in the earth, making them very firm, but vastly increasing their liability to decay. Stringers, 14 by 16 inches.

Are trestles very short and strong.

No. 3, Dry Run, 2½ miles from junction with main line.

Near by the last No. is the sharpest curve on the road, of 12°, or about 480 feet.

Nos. 4 and 5. Curve.

Twenty-five feet trussed girder, having four rods; good.

No. 6.

Another trussed girder of 20 feet, and 11 panels, 18 feet, averaging 12 feet high, with timbers 10 by 10 inches; batter post, 8 by 10 inches, and a few a little smaller.

Nos. 7 and 8.

Short, 15 feet spans, with good stringers.

Nos. 9 and 10.

Under this No. I include seven short, low trestles, from 20 to 40 feet long, with good full-bolted guard rails, and stringers 12 by 16 inches. All these span a small winter stream.

No. 11.

Three short spans, like the preceding.

No. 12.

Five 18 feet panels, 10 or 12 feet high, with 10-inch timbers, and floor as usual.

No. 13.

Five 18 feet panels of 10-inch timber; stringers, 14 by 16 inches. There is one panel 25 feet long, with double 10 by 15 inches stringers. Ties, 12 inches apart; ribbons, well bolted, and top of rail about 20 feet above the ground.

No. 14, Nine Mile creek.

Sixteen panels, usual length. At highest point 44 feet above ground, with 12-inch single length posts, all good.

No. 15.

Six panels, highest point 38 feet; stringers, 12 by 15 feet; good floor and ribbons.

No. 16.

- No. 17. Seven panels, in all respects like the rest; height, 20 feet at greatest.
- No. 18, called 9 Mile Trestle. Trestle, 51 feet high at the highest point. West end has seven 18 feet panels, with single pieces of timber 12 by 15 inches. Next, 23 panels of two-story work, with 4 longitudinal horizontal braces. Of the 23 spans, three are 22 feet long, with double 8 by 15 inches stringers. The other stringers are single and 14 by 16 inches. Next four, single story bents, and one 40 feet trussed girder, with 3 rods on each side, 1½ inches, and double stringers 9 by 15 inches. The floor and ribbons are good.
- No. 19. Ten panels, 18 feet each, and 20 feet at highest point. The stringers are irregular, some are 12 by 16 inches and single, some double, 6 by 16 inches, some 14 by 15 inches single, and others double, 8 by 15 inches. The floor is good.
- No. 20. 36 panels, 18 feet, and one 20 feet, with stringers 14 by 16 on longest panel; others, 12 by 15 inches.
- Nos. 21 and 22. Three spans, 15 feet high; and 7 spans, 18 or 20 feet, at highest—all good.
- No. 22 (a). 21 spans; highest, from 25 to 35 feet; one, 40 feet. Trussed girder, having 3 rods on each side. Track-stringers are double, and are 8 by 15 inches.
- No. 23. Fourteen spans; 25 feet at highest point. There is one trussed girder, 31½ feet long, with triple 1½-inch rods; and double stringers, 8 by 16 inches. The floor is too open, otherwise everything is good.
- No. 24. 30 panels; all as usual; 20 to 25 feet at highest point. There is one trussed girder of 35 feet, having three-inch and a half rods on each side; all very fair. Half of the road is now (August, 1881), well ballasted, and the remainder soon will be.
4. Main Line, from Richmond to Sardinia.
- No. 1. 36 spans; usual form; and one 40 feet trussed girder, having three rods on each side, and double 9 by 16-inch stringers. There is one 26 feet span, with double 9 by 21-inch stringers.
- No. 2. • Four panels; usual length; and one 26 feet, with double 9 by 21-inch stringers. This makes a rather bad shake under a locomotive.
- No. 3. Eleven spans; about 15 feet high; made in the uniform way.
- No. 4. Fifteen spans; about 12 feet at highest point.
- No. 5. Six spans; 10 feet high. Timbers, 6 by 10 to 8 by 10, according to position.
- No. 6, Ellston Station. Twenty panels, and a forty feet trussed girder, like those before named. The flooring is at 15 inches open space, and is not good.
- No. 7. Six panels of the usual make.
- No. 8, Hall's run. Four panels of the usual length, and one 25 feet; and one trussed girder of 40 feet, in the usual way.
- No. 9, Salt Run. Twenty panels, about 12 feet high at the highest point; and one 40 feet trussed girder, of the usual form.
- No. 10. Three spans; 10 or 12 feet high.
- No. 11. Five spans; from 12 to 15 feet high.
- No. 12. Seven panels, about 10 feet at highest; and one 40 feet trussed girder. Over Shaler's run.
- No. 13, small stream. Nine panels; 15 feet high.

The former trestle is 18 feet high, and has 6 panels; the other, 5 Nos. 14 and 15. panels, and 15 feet high.

Five spans, 15 feet high; 4 spans, 12 feet high; 4 spans, 10 feet high, Nos. 16, 17 and 18. respectively.

Twelve spans; 10 or 12 feet high; and one trussed girder of the No. 19, Olive usual style. Branch.

Five 18 feet panels, 10 feet high; two 25 feet panels, with double 6 No. 20, East by 21-inch stringers; also one 40 feet trussed girder, with triple  $1\frac{1}{2}$  rods, Fork. and double 8 by 16-inch stringers.

Then a deck Howe Truss of 16 panels, each  $9\frac{7}{10}$  feet. Breadth, 12 Truss. feet; height, 21 feet, and like the preceding Howe Truss at the Miami.

Also one 50 feet trussed girder, with stringers 8 by 16, triple  $1\frac{1}{2}$ -inch Trussed gir- rods. The flooring is fair; the piers good. Next, one 25 feet spans, der. with double 6 by 21 inches, and 20 more; cross-braced, and having 2 longitudinal string pieces. The timbers are 12 by 12 inches. At the highest point the structure is nearly 40 feet high.

Five and four panels, respectively, and 15 and 10 feet high, at most, Nos. 21 and 22. Six and three panels, respectively. Nos. 23 and 24.

Eight panels, 15 feet high; over dry bed of a stream. No. 25.

Fourteen panels, 15 feet high; all made as usual. No. 26.

Four panels, 10 feet high. Seven or eight of these are near Batavia. No. 27.

Between Afton and Williamsburg there is, first, a 2 panel trestle; No. 28. then a 22 panel one, ranging through various heights from 20 to 35 feet, having 4 longitudinal horizontal braces, also lateral braces; all the work in the usual style.

Howe Truss; 16 panels,  $9\frac{3}{8}$  feet, 13 feet wide, 21 feet high. Floor No. 29. beams, 6 by 14 inches, and 4 to a panel. The chords are 4 pieces, 6 by 13 for the lower, and 6 by 11 for the upper. Floor as usual. Rods are in threes, and vary from  $1\frac{1}{8}$  to 2 inches. Main braces vary from 6 by 10 to  $8\frac{1}{2}$  by 11 inches; the counters from 6 by 8 to 8 by 8 inches. The west approach consists of 8 panels of frame trestle work, of timbers from 10 to 12 inches. The east abutment is a double frame bent.

Four panels, 10 feet high; all right. No. 29 (a).

Four panels, 12 feet high. No. 30.

Under this head I embrace 4 or 5 three panel trestles, from 6 to 8 No. 31. feet above ground.

Four panel trestle, 7 feet high. No. 32.

Twenty-seven panels, 18 or 20 feet high; one trussed girder of two- 3 miles from story build, and square rods  $1\frac{1}{2}$  inches diameter. There is one 25 feet Williamsburg. span, with the corresponding increase in the timbers.

Twelve panels, 18 to 20 feet high. No. 34.

Howe Truss; 16 panels,  $9\frac{1}{2}$  feet, 13 feet wide, 21 feet high. Chords, No. 35. four pieces, 5 by 12 inches in the lower chord, and 2 inches less in the upper chord. Rods, in the 4 panels on one side of the center of the truss, are double; in the two outer panels they are by threes, and all run from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inches. The abutments are double frame bents. The west approach consists of 28 panels, twenty-eight feet high. Among these is a 40 feet span, supported as in Bollman's bridges; the rods being  $1\frac{1}{2}$  inches. The east approach consists of 6 panels of a less height.

22 panel trestle, 35 feet high; among the panels is found one trussed No. 35 (a). girder, with double square rods  $1\frac{1}{2}$  inches, and extending several feet below the bottom of the stringer.

- No. 36. Is a 6 panel trestle, 20 feet high.
- No. 37. Five panel trestle, ranging from 16 to 20 feet high.
- No. 38. Fourteen panels, from 20 to 25 feet high.
- No. 39. Thirteen panels, from 16 to 20 feet high ; 6 by 6 inches ribbons, well bolted.
- No. 40. Howe Truss. In all essentials a copy of 35 above given (which see). The west approach has 21 panels of trestle, about 20 feet high on an average. The east approach has 12 ; all good. The floor has ties 5 by 8 inches, all notched on the stringers, and are only 8 inches apart. The ribbons also are properly notched.
- Remark. The road from Sardinia to Winchester was examined from the east toward the west, and the following structures therefore are in reverse order.
5. Main Line, from east of Winchester to Sardinia.
- Half mile east of Winchester. Here is a long and very high trestle, being 64 feet at the highest point ; at which place in the structure there is a 40 feet trussed girder, having three 2-inch rods on each side, extending 5 feet below the bottom of the stringers, which are 10 by 16 inches, and double. The ordinary stringer is 6 by 16 inches. The ribbons are 6 by 7 inches, notched and bolted. The floor consists of ties 8 feet long, 5 by 7 inches, and at intervals of 6 inches. The eastern part of the trestle has 14 bents of the usual 4 post arrangement, and at the highest point is 25 feet above ground. The central part has 22 panels of the usual length, 18 feet, near the middle of which the trussed girder is placed. The high part is very strongly braced, both laterally and longitudinally. To the westward are 10 more bents in the usual form, but not so high ; just completed.
- Further to the west. Is another trestle of 3 spans, and 20 feet high ; new and strong. Another of 22 spaces, 25 feet at highest point, and all first-rate.
- General remarks. This road is fairly ballasted, from the Junction to Williamsburg, and a short distance further. At irregular intervals also the track has patches of ballast ; but over half the way it is only earth ballast. In these portions, therefore, the track is wanting in solidity, and the surfacing and alignment are consequently in rather bad condition. But work in ballasting is progressing rapidly, the company owning as fine a gravel bank as any in the State.
- West of Winchester ; Nos. 1, 2, 3 and 4. Three panels, eight feet high ; and then three more, from 20 to 25 feet high.
- No. 5. 23 spans, 40 feet high at the highest point, made of 10-inch timbers. Floor, ribbons and stringers in the usual good style.
- No. 6. Eighteen panels, from 20 to 25 feet high.
- Nos. 7 and 8. Each of 3 panels, and 10 feet high ; one over a roadway.
- Nos. 9 and 10. The first, 3 panels, 7 feet high ; the second, 5 panels, 8 to 10 feet high, and both are openings for water.
- No. 11. 3 panel water way.
- Near Sardinia ; No. 12. Nine panels, from 16 to 18 feet high ; all first rate.
6. Maysville and Columbus, from Sardinia to Hillsboro.
- From Sardinia toward Hillsboro ; No. 1. Howe Truss ; 12 panels ; width of bridge, 13 feet ; height, 21 feet, nearly. The main braces range from 6 by 8 to 9 by 8 inches ; the counters, from 6 by 6 to 7 by 8 inches. Lower chord, 4 pieces, 6 by 12 inches.

Upper chord, 2 inches less deep. The two end panels have 3 rods each, from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches; the other four panels of the half truss have each two rods, from  $1\frac{1}{4}$  to  $1\frac{3}{4}$  inches. Track stringers double, 6 by 15 inches. Floor, 5 by 7 inches; ties at 6 inches intervals. Ribbons, 4 by 6 inches, notched. The west approach has 4 panels, 18 feet each; the east, 7 such panels, and 18 feet high. The abutments and approaches are on piles which have the bark on. Piles are cross braced.

This road is almost without ballast, and has all the *vices* of such roads. There is a little stone ballast in the cuts. Remarks.

Six panels, say 15 feet high. Piles cross-braced, and floor as before. No. 2.

The first, 2 panels, 6 feet high; the second, 3 panels, from 6 to 8 feet high. Nos. 3 and 4.

Five panels, from 10 to 12 feet high, of 10-inch timbers; the next 10 panels, from 12 to 15 feet high, on 10 and 12-inch piles or timber. Nos. 5 and 6.

Six panels, from 15 to 18 feet high; 3 panels, 10 feet high; three 12 feet panels, 8 feet high. Nos. 7, 8 and 9.

The first, 4 panels, from 6 to 8 feet high; the next, 16 panels, 25 feet high. There is among these one span of 30 feet, in which there are double stringers, 8 by 21 inches. The floor is 5 by 7 inches; the ribbons, 4 by 5 inches, and bolted. Nine miles from Sardinia. Nos. 10 and 11.

Three 10 feet panels, 6 or 7 feet high; then three 12 feet panels, 7 or 8 feet high. Nos. 12 and 13.

The first, three 15 feet panels, from 8 to 10 feet; the second, three 18 feet panels, from 10 to 12 feet high. Nos. 14 and 15.

Three 18 feet panels, from 8 to 10 feet high. No. 16.

Nine 18 feet panels, from 15 to 18 feet high; on cross-braced piles. No. 17.

Three 18 feet panels, on piles, 12 to 15 feet high. No. 18.

Each three 18 feet panels, from 8 to 10 feet high. Nos. 19 and 20.

Ten panels, 18 feet; 12 to 15 feet high; one panel is at least 25 feet long, but has the usual heavy stringers. Piles cross-braced. No. 21.

Eight 18 feet panels, 12 to 15 feet high; on cross-braced piles; one, say 25 feet long, and arranged as usual. No. 22, near Hillsboro.

A cattle pass; three panels, 10 feet high. No. 23.

Twenty-one 18 feet panels, 20 feet high; on frames of 10-inch timber. No. 24.

Nine 18 feet panels, from 25 to 30 feet high. No. 25.

The fencing on all these narrow gauge new roads is yet in great part to be built. Fencing.

## XII. CINCINNATI, GEORGETOWN AND PORTSMOUTH RAILROAD, from Cincinnati eastward.

Trestle, 1600 feet long. The bents are of the 4 post usual form; average height, 10 feet; timbers, 12 inches square; panels, 20 feet from center to center. The floor is very close, having only 2 inches open space between the ties. All very good. No. 1, 1878, near Columbia.

Trestle, 2000 feet long; 23 feet at the highest point, but averages 15 feet. The ties are 6 by 7 inches, at 13 inches intervals, which is too great a distance for safety in case of derailment. Ribbons, 5 by 5 inches, notched. The trestle work extends to the Miami bridge. No. 2, Miami Valley.

Iron, three spans. Middle, 12 panels; total length, 200 feet; end No. 3, Miami River.



spans, say 170 feet. End struts consist of three pieces of timber, 7, 10 and 7 inches, respectively, by 15 inches deep. Posts near the center, 10 inches square. The bridge is 28 feet high, and 12 feet clear breadth. The lower chord in the center panels has 4 bars, 5 by 1½ inches; the next, four bars, 5 by 1 inches; the next, four, 4 by 1½ inches; the next, four, 4 by ¾ inches; the two panels, or double panel next the pier, has two pieces, 4 by 1 inches. The posts near the center are 10 inches square; the counter rods at the center are double, 1½ inches; in the next panel single, and 1½ inches; in the next two, ¾-inch. The double tie bars of the second panel run diagonally, and are 5 by 1½ inches; in the third panel, 4 by 1½ inches; in the fourth, 4 by 1½ inches; in the fifth, 3 by ¾ inches. The top chord is octagonal; pins, 2½ inches; stirrups, 1½ inches square; lateral brace rods, from 1 to 1½ inches. The floor beams are double, 9 by 16 inches. The stringers are triple, 5 by 15 inches, with one under each end of the ties. The ties are 6 by 7 inches, and are at 9 inches intervals. The ribbons are 5 by 5 inches, notched and bolted, at 6 feet intervals. The upper lateral bracing is double, and has the usual sway rods at the top. The piers are of good masonry; the abutments are double frame bents of 12-inch square timber.

#### End spans.

These have 9 panels; on the same general plan, with the pieces proportionally smaller. The end struts are double, 10 by 12-inch posts; center posts, iron, 8 by 10 inches. Upper chord, similar to the preceding. The lower chord in the end double panel consists of 2 bars, 3¾ by ¾ inches; next, four pieces, same depth, but ¾-inch; the next, four, same depth, and ¾-inch; the center, four, same depth, and 1 inch. The height of the truss is 24 feet; the clear width, 12 feet. The stringers are triple, 5 by 15 inches, and an extra piece of the same size under each end. Ties and floor as before.

#### No. 4.

East approach is a trestle, 575 feet long, 38 feet at the highest point. The piles are double braced, and there are longitudinal braces.

#### No. 5, Gully.

Here are seven panels or bents, each 20 feet, and 25 feet high at the highest point. Frame. Floor as before.

The panels in the trestle work are all, or nearly all, 20 feet, and if any vary from this figure, it will be named.

#### No. 6.

80 feet long, and 15 feet high.

#### No. 7.

200 feet long, and 37 feet high.

#### No. 8.

14 panels, at highest point 40 feet. Five are two story, and double braced, and have longitudinal beams also.

#### No. 9.

12 panels, 40 feet high where highest; 6 are double frames, and are braced as in No. 8. There is one trussed girder, 30 feet long, and reinforced by a single rod on each side, 2½ inches diameter, and extending below the bottom of the stringer 1½ feet.

#### No. 10.

Has 4 panels, and is 15 feet at highest point.

#### No. 11.

Has 8 panels, and is 21 feet high; made like all the rest.

#### No. 12.

Has 2 panels, and is 8 feet high.

#### No. 13.

Has 18 panels, and is 18 feet high at the highest point.

#### No. 14.

Has 8 panels, of which 3 are two-story; all good and new.

#### No. 15.

Has 10 panels, and is at highest point 15 feet.

#### No. 16.

Has 6 panels, and is 10 feet at highest point.

#### No. 17.

Has 18 panels, and is from 12 to 15 feet high.

#### No. 18.

Has 9 panels, and is from 10 to 15 feet high.



Has 3 panels, and is from 8 to 10 feet. No. 19.  
 Has 3 panels, and is from 6 to 8 feet high. No. 20.  
 Has 5 panels, and is from 12 to 15 feet high. No. 21.  
 Has 16 panels, and at the central part is 50 feet high; and 8 of the No. 22.  
 bents are two-story, and braced as usual on this road.

Has 11 panels, is 35 feet at highest point; has 8 two-story bents, No. 23.  
 braced as usual.

Has 6 panels; 15 feet, highest. No. 24.

Has 16 panels, is 30 feet high, and has 7 two-story bents. The rib- No. 25.  
 bons are set between the rails; the floor has 4-inch open spaces.

Has 13 panels, 25 feet high; three bents, 2-story. No. 26.

Has 25 panels, is 40 feet at highest point, and for half the length is No. 27.  
 double braced; and is of oak lumber.

Has 12 bents; at highest point, 25 feet, and is oak. No. 28.

Has 23 bents, is 21 feet high, also of oak. No. 29.

Has 8 bents, is 8 feet high, and is of oak, and very good. No. 30.

Has 12 bents, 16 feet each; is 25 feet at highest point. It has one No. 31.  
 30-feet trussed girder, with a single rod of 1½ inches on each side, 15  
 inches below chord. The stringers are double, 7 by 15 inches, and the  
 floor is close.

Has 19 panels of 16 feet each, from 12 to 20 feet; of oak, and the No. 32.  
 floor close.

25 panels; total length, 500 feet; at highest point, 40 feet above No. 33.  
 ground. There is one trussed girder, 40 feet long, and 45 feet high;  
 double 1½-inch rods on each side, dropping 2½ feet below stringer; floor,  
 close. There are 4 longitudinal braces; all the high parts are double  
 braced; timbers, oak, and all good; the last four have no guard rails or  
 ribbons at the date of examination, August, 1881, but soon would have.  
 Eight miles of the track have been finished, and used but 6 weeks.

All the ties are of first quality; there is little or no fencing made by Gen'l remark.  
 the railroad authorities; the cuts are all fairly well ballasted, but there  
 is little or no ballast on any other part of the road. The last 8 miles have  
 40-pound rails, the remainder, 35-pound.

### XIII. OHIO AND MISSISSIPPI RAILWAY, from Cincinnati westward.

Trussed girder; frame approach on the east; 3 bents, each 22 feet. No. 1, Mill  
 West approach same as the east, forty feet high; there are 2 bars on creek, 1879.  
 each side of the girder bridge, 3 inches deep by ¾-inch thick, dropping  
 5 feet.

The piers for the pony Howe Truss stand on piles; the frames are Howe Truss,  
 of 12-inch-square timber, and are 50 feet high, but are very securely  
 braced, as is made necessary by danger from ice. The truss is 71 feet  
 long, of 10 panels of 6 feet each. The track-stringers are double, and 10  
 by 18 inches. The floor beams are 8 by 16 inches, the ties 6 by 8 inches,  
 and at 6 inches intervals. Ribbons, same size as ties and well bolted.  
 The lower chord has 3 pieces, 6 by 14 inches; the upper, same, except  
 the depth is 12 inches. The main braces run from 8 by 10 to 10 by 10  
 inches; the counters are 6 by 6 inches; rods are double, and vary from  
 1½ to 1¾ inches. The total length of the bridge and the approaches is  
 200 feet. The masonry at the extreme ends is of the first quality.

Howe Truss, and trestle approaches on the east and west. The No. 2, Mud  
 frames are of the usual four posts, two upright and two batter; there Run, 11 miles  
 are six panels in the east approach. The stringers are single pieces 12 from Cincin-  
 nati, 1875.

by 18 inches, and there is an extra piece under the ends of the ties; the ties are 6 by 8 inches, at 4 inches interval; the ribbons are 7 by 10 inches, and are notched and well bolted. The west approach has 5 panels, but in essentials is the same as the east. The low Howe Truss is a counterpart of the one just described. The whole structure is good.

Pony truss in the middle.

Remark.

The track also is in good condition, the ballast being good, and having enough. For a good part of the way, it would be deemed inexpedient to fence the track, by reason of the situation of the road on the bank of the Ohio river.

State line.  
Miami river  
bridge. 1867.  
Iron.

This is a bridge only partly in Ohio, and so much of it as is in the State is here described. Of the three spans, one and a half comes in Ohio. The pattern of the bridge is that called "Fink." The floor beams are I-beams, 15 inches deep, with the flange 5 inches wide, and the web is  $\frac{3}{4}$ -inch thick. On these are placed oak timber, 12 by 14 inches. The track-stringers are 8 by 16 inches, and double; there are also extra stringers at ends of the ties; stiffening irons are employed in the usual way.

The top chord is a 14-inch cylinder; the columns are composed of 4 segments,  $7\frac{1}{2}$  inches, joined as in the Phoenix column.

In the measured truss are 16 panels, each 13 feet. The columns vary in size according to their position, the "quarter column" being  $8\frac{1}{2}$  inches. The center pin is  $4\frac{1}{2}$  inches, the quarter pin 3 inches, and the intermediate  $2\frac{1}{2}$  inches. The half posts are quadruple, the quarters, double; these have extra ribs for bracing purposes.

The bars extending to the middle of the span are 8 in number on each side, 6 inches deep, and  $\frac{5}{8}$ -inch thick. The quarter bars are quadruple, 5 inches deep by  $\frac{3}{4}$ -inch thick. The eighth bars are double, and are  $3\frac{1}{2}$  by  $\frac{5}{8}$  inches. The middle column is hexagonal, 9 inches on a side. In the center of the eighth spaces are double suspending bars, 1 by 2 inches.

The upper lateral bracing is different from that usually seen. The rods are at right angles to the length of the bridge, and the I-beams are diagonally placed.

The pier posts, as also the abutment posts, are columns of stone  $5\frac{1}{2}$  feet square. The pier top is  $6\frac{1}{2}$  feet wide. The piers and abutments stand on piles, driven till they reach 10 feet below the bottom of the Ohio river. The grillage is triple and is of 12-inch-square lumber. The upper rods in all the panels are  $2\frac{1}{2}$  inches.

Remark.

The piers and abutments are first class.

#### XIV. CINCINNATI, INDIANAPOLIS, ST. LOUIS AND CHICAGO, from Cincinnati to Harrison and Lawrenceburg.

The examination was made, beginning at the state line on the branch leading to Lawrenceburg, Ind. The first structure is near Elizabethtown.

White Water.  
1873.

Howe Truss, two spans, continuous, 14 panels each, 10 feet 10 inches in a panel, height, say 21 feet. The main braces are all 9 by 11 inches; the counters, 8 by 9 inches. The suspension rods are in pairs, near the center of the truss, and for two or three panels next the abutment they are in triplet, varying from  $1\frac{3}{4}$  to 2 inches. Floor beams 6 by 16 inches, and five to a panel; stringers, 10 by 10 inches; flooring, 4 by

10 inches, at 2 inches interval. Guard rails, 4 by 5 inches; lateral braces, 6 by 6 inches; rods,  $1\frac{1}{4}$  inches; upper bracing like the lower. The lower chord has 4 timbers, 7 by 15 inches; the top has the usual depth, less than the lower by 2 inches. Masonry is good, and the abutments and embankment are well rip-rapped.

On the older portion of the track there is a fair amount of good stone ballast, and the road is in good condition. Remark.

Pony truss, four spans, each having 8 panels of  $6\frac{1}{2}$  feet; height,  $6\frac{1}{2}$  feet. The lower chord has three pieces,  $4\frac{1}{2}$ , 8, and  $4\frac{1}{2}$  inches by 12; the other chord, two inches less in depth. Main braces, 6 by  $7\frac{1}{2}$  inches; the counters, 5 by 6 inches. Lower laterals, 6 by 6 inches. The suspension rods are double, and vary from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. The floor is like that last described. The piers and abutments are good. The track to Harrison is moderately well ballasted, but in pretty fair condition, considering the amount of traffic. Remarks.

Dry run, five miles from Harrison. 1879.

Pony Howe deck of 8 spans, each span has 10 panels, each  $5\frac{1}{2}$  feet;  $7\frac{1}{2}$  feet high, and 14 feet broad. Lower chord is composed of four pieces, 6 by 12 inches; the upper, the usual two inches less. The main braces are  $7\frac{1}{2}$  by 9 inches; the counters, 6 by 7 inches. The suspension rods are double, and run from  $1\frac{3}{4}$  down to  $1\frac{1}{4}$  inches. Flooring, 8 by 4 inches, at 5 inches interval. There is no guard rail; but I was assured that the floor would be shortly renewed, and the ribbons be added then. There are 4 sway braces in each panel, 8 by 10 inches.

Miami river, one mile from the Lawrenceburg Junction. 1874.

Some of the packing blocks are much decayed, with the necessary accompanying deterioration of the adjacent chords. The piers are the old aqueduct piers built for the canal, and they are all more or less battered by the successive yearly poundings given by the ice; yet the strength is not yet diminished to any great extent.

This is the old canal brick tunnel, 1400 feet long, and 24 feet wide; all in good condition, except a small space near the north end. Tunnel.

Pony Howe of 12 panels, 6 feet each;  $9\frac{1}{2}$  clear height, and of the usual width. Floor, close and good. The lower chord has three pieces, 6, 8 and 6 inches, respectively, and 14 inches deep; the upper chord, 2 inches less in depth. The main braces are 8 by 10 inches; the counters, 5 by 6 inches. The lower laterals are 6 by 7 inches, and rods 1 inch. The suspension rods are double, and run from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches. There is a set of sway braces at each end. The corbels are 10 feet long on the east and west trestle approach to the bridge. The guard rails are small, and not very effective. Near the middle of the bridge are rotten packing blocks, like those above named. The bridge can not last much longer, possibly a year or two. Mud run.

The east and west approaches have each 5 panels,  $14\frac{1}{2}$  feet each, and at the end next the bridge the track is 30 feet from the ground. This structure stands side by side with the O. & M. bridge over the same stream; the timbers are a little stronger in this. The frame abutment posts are 14 by 14 inches; the caps, 14 by 16 inches; the vertical posts, 12 by 14 inches; and the batter posts, 12 by 12 inches. There is a horizontal lateral brace midway of the posts, and double sway braces on the timbers of the bents.

The track is mostly fairly well ballasted, and in good condition. The trestle work has longitudinal girder bracing, 6 by 12 inches, well bolted; the approaches, same as at Mud run. Ballast.

Mill creek.

There is a stone arch over Mill creek, 67 by 28 feet, of first-class work.

XV. LOUISVILLE SHORT LINE. So much of the bridge as is in Ohio. Cincinnati.

Next to the river.

One span of 9 panels, iron quadrangular, having Phoenix columns, 10 feet long at the south end, 13 feet at north end; panel length,  $10\frac{1}{2}$  feet; total, 94 feet. The floor beams are made of plates 20 by  $\frac{3}{8}$  inches deep; top plate of floor beam 6 by 1 inches; bottom, 12 by  $\frac{3}{8}$  inches, riveted with full angle irons, 2 by 2 by  $\frac{3}{8}$  inches. The flooring ties are 5 by 8 inches, at 9 inches intervals. There are four track-stringers, two 5 and two 6 inches wide, all 14 inches deep. Counting from the south, the end post is 10 inches; the next three each 6 inches; the next, 8 by 13 inches; the next, 9 by 15 inches.

The main rods in the first panel are one 2-inch square rod; the second panel, 2 bars,  $1\frac{1}{8}$  inches square; increasing to 3 inches square in the center span. The counters run from  $1\frac{1}{2}$  to 2-inch bars. The truss being too low for the top lateral bracing, it is stiffened by outside braces, with 3 feet base, braces being made of 2 channel bars 6 by 2 inches, and double.

Second span.

The next span is like the first in all its main features. Columns being of the same thickness, but running from 13 feet to 18 feet high; but the bars are  $\frac{1}{8}$ -inch less in several places or panels.

Brick arches.  
Whipple  
Truss.

Next follow three brick arches; total extent, 137 feet.

Then comes a Whipple Truss, 125 feet span, of 12 panels, of equal length; width, 14 feet; height,  $20\frac{1}{2}$  clear. The upper chord is made of two 8-inch channel bars, with corresponding plate. The floor beams are double I-beams, 15 inches deep,  $4\frac{1}{2}$  inches flange,  $\frac{3}{8}$ -inch thick; pins, 3 inches. The suspension bars are  $1\frac{1}{2}$  square, and double. The track-stringers are as in the first span above, except 2 of them are each 1 inch thicker. The upper cross-bracing consists of the usual 6-inch I beams, and diagonal rods  $1\frac{1}{4}$  inches in diameter. Lower, same, in all essentials. The end posts or struts are composed of four 5-inch channel bars, with 2-inch flange, and of  $\frac{3}{8}$ -inch iron. There are four connecting plates. The base of the column rests on a plate 20 inches square.

Other spans.

Next come five spans of 12 panels each,  $6\frac{3}{4}$  feet long, and  $7\frac{1}{2}$  high, and 11 feet broad in the clear. Of course, these are deck spans. The end columns are 8 inches; the next two, 6 inches; the next four, 4 inches. The main suspension bars run from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  inches, and of course are in pairs. The counters run from 1 to  $1\frac{1}{4}$  inches. The upper and lower lateral rods are 1 inch. There are sway braces in every panel. The lower chord has 4 bars 7 by  $\frac{5}{8}$  inches, and all the same. The upper chord is made up of 2 channel bars, 9 inches by 2 by  $\frac{3}{8}$ -inch iron, with a plate 12 by  $\frac{3}{8}$  inches. The lower cross stiffening beams are double 6-inch channel bars of  $\frac{3}{8}$  iron, 2-inch flange, connected throughout their length at 18 inches intervals. There are 9 such beams in a span. Pins,  $2\frac{1}{2}$  inches.

More spans.

Then follow two spans of 10 panels, each of the same length as given above, but the rods are  $\frac{1}{8}$  inch less; other pieces unchanged.

Trestle work.

Next come 24 panels of trestle work, 16 feet to the panel, from 8 to 18 feet high, made of 12 inches square timber. There are longitudinal

and lateral bracing all the way. The bents, instead of the usual form of vertical and batter posts, have the four pieces all inclined as batter posts usually are, the pair on each side meeting under the rail.

Next come 17 panels, of length as the former, made of 10-inch timber, having corbels 3 feet long, and 10 by 16 inches cross-section. Floor as before, and not necessary to repeat. Ribbons, 5 by 6 inches, and notched. Track-stringers are double 7 by 16-inch beams for the greater part of the distance. The whole structure is of the very best, and well able to bear a load several times greater than any that could conveniently be put upon it. And more.

#### XVI. CINCINNATI SOUTHERN RAILWAY BRIDGE, or so much of it as is in the State of Ohio.

The first part of the trestle approach to the river bridge begins near the depot, and extends 222 feet to the first low frame truss or bent. The flooring is 5 by 8 inches, at 4 inches intervals. Ribbons, 4 by 8 inches, and notched. Stringers, 14 by 14 inches, and extra pieces under the ends of the ties. The timbers of the low bents are 14 by 14 inches. Near the Cincinnati depot.

Next follow 41 panels, 15 feet long each, beginning with a height of 5 feet, and ending at 10 feet. There are triple stringers, 6 by 16 inches, also end bearers, 8 by 16 inches, with flooring as at the first. Timbers, 12 by 12 inches. Ribbons, 6 by 10 inches, notched and full bolted. The inside of the ribbons is covered with angle iron. Of these the last 11 bents are cross-braced. Also the last 3 or 4 before reaching the iron girder named below, have sets of longitudinal braces, reaching from the sill of one bent to the cap of the adjoining one. Higher trestles.

Then follows an iron girder over the strut, 40 feet long, 12 feet high, and 12 feet wide. The 40 feet are divided into 4 compartments or spaces. The posts are composed of two channel bars, 10 by 2½ inches; and two plates, 10 by ⅝ inches; the upper cross rods are from 3 to 6 feet apart. The cross-bracing is done by two channel bars, 6 by 2 inches, with the usual diagonal braces. The plate girder is 4 feet deep, and has sway braces of iron bars 2 by ¾ inches. The girder has 7 stiffening bars. The floor is 7 by 11 inches, at 4 inches intervals. Ribbons secured as at the preceding portion of the trestle. Iron girder.

Then follow 23 bents, of 15 feet each, varying from 30 to 40 feet high, based on piles. The vertical and batter posts have longitudinal beams bolted at the foot of the posts, and also half way up. They measure 6 by 12 inches. There are two sets of sway braces at each bent, and a horizontal transverse beam bolted to the posts, half way up the posts. More bents.

Then follow 19 bents, 16 feet long each, having the piles braced by one piece. More and more.

The first part of the bridge consists of three spans, of 100 feet each, with 6 panels, of usual width and height. The pins of the lower chord are 2¼ inches diameter. The lower chord in the four inner panels has 4 bars, 3 by ⅞ inches average; the end panels, 2 bars, 3 by 1½ inches. The posts are 8 by 6 inches; the counter rods in the second panel are ⅝-inch; in the next panel ¾-inch. The main suspension bars are double, at the second panel from the end they are 3½ by 1¼ inches thick; in the next panel, 3½ by ¾ inches. The end strut has two channel bars, of 12 Bridge.

inches, and a plate of 14 inches. The suspension bars at the end of the first panels are  $2\frac{1}{2}$  by  $\frac{7}{8}$  inches

Longer spans. Then follow 2 spans, of 200 feet each, having for lower chord in the end panel two bars, 4 by  $1\frac{1}{2}$  inches; second panel, four bars, 4 by  $\frac{3}{4}$  inches; third panel, four bars, 4 by 1 inches; the fourth panel, six bars, 4 by 1 inches; the fifth panel, six bars, 5 by 1 inches. The main suspension bars cross two panels each, except, of course, at the ends of the bridge or span; the first set of two, in the second panel, are  $4\frac{1}{2}$  by 1 inches; crossing the second and the third panels, two, 5 by 1 inches; crossing the third and fourth panels, 4 by  $\frac{7}{8}$  inches; crossing the fourth and fifth,  $2\frac{1}{2}$  by 1 inches; crossing the fifth and sixth, i. e., the two middle panels,  $1\frac{1}{2}$  inches square. The posts are 8 by 7 inches. Double suspension bar at end of first panel,  $2\frac{1}{2}$  by 1 inches. The end struts have two 15-inch plates, connected by an 18-inch plate,  $\frac{5}{16}$ -inch thick, with strong stiffening and connecting iron. The lateral brace rods vary from  $\frac{3}{4}$  to 2 inches. The upper chord has its section to correspond with the end struts. The track-stringers are I-beams, 20 inches deep by 9 inches wide at the upper and lower flange of  $\frac{1}{4}$ -inch iron. The floor beams are  $2\frac{1}{2}$  feet, by 10 inches flange, reinforced by top plate of  $\frac{5}{8}$ -inch iron in the middle. Pins, 5 inches.

The whole of first class work; and the piers throughout are also of first class masonry.

300 feet span. The last span in Ohio is 300 feet long, and of proportionate height, say 37 feet, not measured. This truss is in essentials the same in construction as the preceding, except the pieces are heavier in due proportion. The stringers are double, and 10 inches wide by 2 feet deep; and two others at the ends, 2 feet by 8 inches; all with angle irons, as usual. Lower lateral braces, from  $1\frac{1}{4}$  to 2 inches. Pins, 5 inches. The main suspension bars are double, from 2 by  $1\frac{1}{2}$  inches at the center, to 5 by 2 inches for the first pair crossing two panels. The first pair of counters reaches to the end of the fourth panel, and are  $\frac{3}{4}$ -inch square; they increase to  $1\frac{1}{2}$  square at the center. The lower chord has 4 bars, 10 by  $1\frac{3}{4}$  inches, at the middle of the span, diminishing to  $1\frac{1}{4}$  inches, and of the same depth in all but in the 4 panels next to the pier. In the 4 panels next to the abutment the depth is 8 inches, and the thickness from  $1\frac{1}{4}$  to 1 inches.

Posts. The posts are rectangular, and are composed of plates, and channel bars in the usual form.

Remarks. This bridge is very strong, and all the approach is in as good condition as it is possible to build, the trusses being wooden.

#### XVII. Note on Scioto Valley bridge at Chillicothe.

In a cursory examination made on Saturday, December 10th, I found the bridge undergoing repairs. Two bents have been set under the chords of the north span, in order to prevent accident, and to remain temporarily till the new bridge can be built. A lot of bridge timber piled near at hand induced me to think that the bridge will shortly be renewed entirely.

#### XVIII. BALTIMORE AND OHIO RAILROAD. Trestle at Parkersburg.

Nine spans, of 13 feet each, about 25 feet high. Track-stringers double, and 12 by 12 inches; flooring, 6 by 8 inches, at 8 inches intervals.

There is longitudinal bracing under the floor, and inclined transverse bracing. The structure is frame, and has excellent stone abutments, but there are no guard rails.

XIX. DAYTON AND UNION RAILROAD, from Dayton westward,

This line is singularly free from bridges, running, as it does, from the mouth toward the head of the water-courses. Only two structures were of a magnitude calling for report.

Of these, one is a piece of trestle work at Baltimore, 56 feet long, Baltimore. having a bad pier in the middle of the main structure, and supports under each half; the timbers themselves are of sufficient size; the track-stringers being double, and 8 by 18 inches; the ties, 8 by 6 inches, and placed 8 inches apart; the ribbon pieces, 6 by 6 inches, and bolted at intervals of 8 feet.

At Greenville is a light bridge of three short spans, perhaps sufficient for the ordinary light loads of the road. Greenville. It is not considered necessary to give the details of the structure in this part of the report, since a special report was made about it in connection with the deepening of the stream over which it is constructed.

The general condition of this connecting link is like that of most connecting roads or cut-offs. It is kept in passable condition, but no money is wasted on repairs, and not much is spent for ornamental purposes. And inasmuch as the structures are very few, there is a measure of safety, both for passengers and for freight, equal to that of other roads in better condition. General remarks.

Respectfully submitted.

R. W. MCFARLAND.

December 16, 1881.



## REPORT OF S. W. ROBINSON, C. E.

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### GENERAL OUTLINE.

- I. BALTIMORE AND OHIO RAILROAD COMPANY'S LINES IN OHIO.
  1. Central Ohio Railroad, from Newark to Bellaire.
  2. Sandusky, Mansfield and Newark Railroad—"Lake Erie Division" of B. & O., from Newark to Sandusky.
  3. Baltimore and Ohio and Chicago Railroad—part of the "Chicago Division" of the B. & O., from Chicago Junction to west State line.
  4. Newark, Somerset and Straitsville Railroad—"Straitsville Branch" of B. & O., from Newark to Shawnee.
- II. INDIANA, BLOOMINGTON AND WESTERN RAILWAY—"OHIO DIVISION."
  1. Cincinnati, Sandusky and Cleveland Railroad, from Sandusky to Springfield.
  2. Columbus, Springfield and Cincinnati Railroad, from Springfield to Columbus.
- III. BELLAIRE AND SOUTHWESTERN RAILWAY, from Bellaire to Woodsfield.
- IV. WABASH, ST. LOUIS AND PACIFIC RAILWAY, from Toledo westward to State line.
- V. CLEVELAND, TUSCARAWAS VALLEY AND WHEELING RAILWAY, from Black River to West Wheeling.
- VI. PENNSYLVANIA COMPANY'S LINES IN OHIO.
  1. Pittsburgh, Ft. Wayne and Chicago Railway.
    - a. "Eastern Division," from east State line to Toledo Junction.
    - b. "Western Division," from Toledo Junction to west State line.
  2. Cleveland and Pittsburgh Railroad.
    - a. Main line, from Cleveland via Bayard to Linton.
    - b. "River Division," from Bellaire via Linton to Wellsville.
    - c. Tuscarawas Branch, from Bayard to New Philadelphia.
  3. North Western Ohio Railway, from Toledo Junction to Toledo.
  4. Ashtabula and Pittsburgh Railway, from Ashtabula to Youngstown.
  5. Lawrence Railroad, from State line to Youngstown.
- VII. CINCINNATI, VAN WERT AND MICHIGAN RAILWAY, from Van Wert northward to Shane's crossing.
  1. North of Van Wert.
  2. South of Van Wert.
- VIII. TOLEDO, CANADA SOUTHERN AND DETROIT RAILWAY—NOTES.
- IX. NEW YORK, PENNSYLVANIA AND OHIO RAILROAD.
  1. Cleveland and Mahoning Valley Railway—"Mahoning Division," from Cleveland to Sharon, Pa.
  2. Niles and New Lisbon Division.
  3. Maine line, from east State line to Dayton, Ohio.

## I. BALTIMORE AND OHIO RAILROAD COMPANY'S LINES IN OHIO.

1. The Central Ohio Railroad, from Newark to Bellaire, inspected July 19th and 20th, 1881.

On this division bridges are numbered in order, tunnels not being numbered. Numbers begin at Newark and end at Bellaire.

Bridge No. 6, at Newark, a through Howe truss, 1 span, 154 feet; Bridges, July 19th. No. 6. depth, 19 feet clear; width,  $15\frac{1}{2}$  feet clear; 14 panels of 11 feet. Main tie rods at end, two  $1\frac{1}{2}$  and one  $1\frac{1}{2}$  inches; next, two  $1\frac{1}{2}$  and one  $1\frac{3}{8}$  inches. Braces,  $7\frac{1}{2}$  by 10 inches; counters, 8 by 8 inches at end; chord, bottom, 6, 7, 7, 6 by 14 inches; top, 6, 7, 7, 6 by 12 inches. Four arches have been added, for increasing the strength, as loads have increased. These spring from cast iron stepped skewbacks, planted upon the cut stone abutment walls, and rise to the upper chord at mid-span. One arch each side of each truss, with iron suspending rods at each panel point, holding to lower chords. Each arch, 6 by 19 inches section, of pine. One trestle bent under west half, at 4th panel point. Iron straps for main tie rods,  $3\frac{1}{2}$  by  $\frac{1}{8}$  inches. Age, 8 years; covered 6 months after built. Lateral system of bracing, 6 by 6 inches; braces and 1-inch tie rods top and bottom.

Roof covered with tin. Many places rusted through and very leaky; sides well covered; clamps and keys at every panel, the clamps being at the one splice at each panel. The lower chords, sounded with a boring bit, proved to be sound at center of sticks.

Floor beams, 5 to the panel,  $6\frac{1}{2}$  by 15 inches; stringers, 8 by 12 inches; ties, 6 by 6 inches and 8 inches between. "Ribbon," "stay lath," or guard rail outside of rails, wood, 6 by 8 inches spliced, and at every 4th tie bolted down, at 5 inches outside of rails.

Wall plates, two, 12 by 12 inches. *See notes.*

Bridge No. 7, over Licking creek, two spans; west span a through **No. 7.** Pratt 100 feet span; depth, 21 feet; width, 15 feet clear; 7 panels; first main tie, two  $1\frac{1}{2}$  by  $3\frac{1}{2}$  inches; second, two, 3 by 1 inches. Posts, open columns, of two channel bars each, 7 by  $\frac{3}{8}$  inches thick "laced." Pins,  $2\frac{3}{8}$  inches. End posts, two channel bars, 10 by  $\frac{7}{16}$  inches, with plate  $\frac{5}{16}$  by 15 inches outside and laced inside. Lower chord, middle four,  $1\frac{1}{2}$  by 4 inches.

Floor beams, two I-beams, 5 by 14 inches; laterals,  $1\frac{1}{2}$ -inch rods; ties, 8 by 8 inches, and 6 inches between; guard rail, 20 inches outside. By B. & O. Co., Mt. Clair.

East span, a through Howe, 115 feet span; depth, 19 feet; 11 panels of 10 feet 6 inches each. Main tie rods, two  $1\frac{1}{2}$  and one  $1\frac{1}{2}$  inches; braces, 8 by 10 inches; 5 years old. At first, full covered, but now each truss is separately covered.

Floor beams, 4 to each panel, 8 by 14 inches; stringers, 8 by 12 inches; ties and ribbons as in No. 6; chords made as in No. 6.

No. 8, a half Howe through, with trusses covered; span,  $41\frac{1}{2}$  feet; **No. 8.** 5 years old; depth, full 7 feet; width, 14 feet clear. Main ties, two,  $1\frac{1}{2}$  inches; braces, 7 by 7 inches; 6 panels.

Floor beams, 8 by 14 inches suspended, three to the panel.

No. 9, a half Howe through, like No. 8. East abutment a lot of No. 9.

piles; not as safe as other structures. State that a stone arch will be put in within a year.

No. 11. No. 11, a Howe truss, covered like No. 7, each truss separately; two spans of 110 feet; depth, 19 feet total; width,  $13\frac{1}{2}$  feet. Sides as in No. 7. Floor beams, 8 by 13 inches, 5 to a panel; stringers, 8 by 12 inches; ties, 6 by 8 inches, 8 inches between; guard rail, 6 by 8 inches, 14 inches outside; 5 years old. Abutments of well cut and laid Ohio sandstone; excellent.

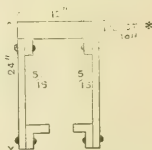
No. 12. No. 12, Muskingum river bridge. An iron Bollman truss bridge of 4 spans, built for two tracks, but now used for one track. Spans, 125 feet each; depth of truss, 19 feet; clear width, 24 feet; 2 trusses each.

West span. The west span differs in details of construction from the three last spans. Top chord, hollow cast iron; struts, cast iron; main end parts partly of stone blocks, laid in cement; one of them fractured and bound about with iron.

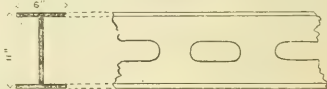
The longest main tie rods are two,  $1\frac{1}{2}$  by 4 $\frac{1}{2}$  inches; shortest, two,  $1\frac{1}{2}$  by 2 $\frac{3}{4}$  inches, and one 1 by 3 $\frac{1}{2}$  inches; counter ties, 1st panel, one, 3 $\frac{3}{4}$  by  $\frac{7}{8}$  inches; 2nd, one, 1 by 3 $\frac{1}{2}$  inches in section.

The floor beams thus, of cast iron top and wrought iron sides.

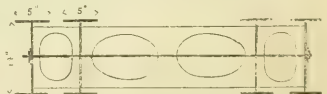
Lateral system double, with 1-inch tie-rods, made at Zanesville.



3 east spans. The 3 east spans. Top chord, octagonal hollow, 12 inches through,  $\frac{3}{4}$  inches thick, cast iron. Main end posts, cast iron. Main struts, cast iron section. Main tie rods, shortest section, two  $\frac{7}{8}$  by 1 $\frac{1}{2}$  in., and two 1-inch rods; longest, two, 2 by 1 inches. These spans are under construction; to be finished by Sept. 1st.



W. approach. The west approach to the above 4-span bridge, a trestle of 280 feet length; spans, each 15 feet c. to c. Trestle bents made of four 12 by 12-inch posts, each one 18 inches of concrete, capped with stone. Trestle caps, 12 by 14-inch sticks; height of posts, 7 feet. Stringers, each of two I-beams, all connected together with cast iron staying and bolts, as shown. These stringers confined to caps of trestles by cast iron knee-pieces.



Near the bridge are two spans, 24 feet each, of girders over struts. Girders consist of 4 I-beams, each 5 $\frac{1}{2}$  by 15, by  $\frac{3}{4}$  inches web, or heavier I-beams. The B. & O. Co. make rails on 10 by 10-inch timbers, suspended to the girders by  $\frac{3}{4}$ -inch bolts and cast iron cap washers, fitted on top of the I-beams.

Draw bridge, over canal, No. 13. At about 100 or 200 feet east of the 4-span bridge is a draw swing bridge, over a canal; of wood—a deck Howe; pivot at center of bridge and on east bank of canal; length over all, 110 feet; 19 panels; depth,

\* In this drawing, instead of the under side being composed of two angle bars, it is as if the two flanges came together, making a solid half I-beam, connecting the sides at the bottom.

about 8 feet. Bridge, wide, with three trusses and double track. Between parts of each truss is an inverted arch, also two saddle rods extend from end to end, each  $1\frac{1}{2}$  inches diameter. Truss, uniform in size of parts, braces  $5\frac{3}{4}$  by 9 inches, and counter, 5 by 9 inches. Main tie rods, all two  $1\frac{1}{2}$  inches, and one 1 inch; rusted.

Rails laid on ribbon strips, 5 by 12 inches, laid on 8 by 12-inch floor beams.

Sounded timbers of lower chord with boring bit, and found slightly browned wood of nearly full strength; structure safe and strong.

A Bollman iron deck over Salt creek, 3 years old, by the Boll- No. 14.  
man Bridge Company. Span, 80 feet; depth, 16 feet; clear width, 14 feet; panels, 5. Upper chords, 10 inches octagon tubes; struts, 6 inches octagon tubes. Main rods, shortest 2, 1 by  $1\frac{1}{2}$ ; longest, 2, 1 by  $1\frac{3}{4}$ . Floor beams iron I-beams, 5 by 15 inches by  $\frac{3}{4}$  inches web; stringers, 5 by 15 inches I-beams, web  $\frac{1}{2}$  inch; ties, 6 by 8 inches, 6 between, placed directly on iron stringers; guard rails, 6 by 8, notched on ties.

No. 15, half Howe; wood, through, 44 feet span; 7 feet height of No. 15.  
truss; 14 feet clear width; 8 panels; 6 years old. Chords without splice, 4, 10, 4 by 10 inches. Trusses covered. Braces, 6 by  $7\frac{1}{2}$  inches. Rods, at end 2,  $1\frac{1}{8}$  inches. Ties, 6 by 8 inches. Stringers, 10 by 12 inches. Floor beams, 8 by 14 inches; 2 to each panel.

No. 16, a half Howe through; 60 feet span. Depth of truss, 9 No. 16.  
feet. Panels, 10. Width, 14 feet. Braces, 7 by 8 inches. Tie rods, 2,  $1\frac{1}{8}$  inches. Curved track. Floor beams, 8 by 14 inches.

At Castle's a trussed girder of about 30 feet span. Girders each 4, 5, Girder.  
5, 4 by 16 inches, with trussed rods 3 by 2 inches, under 2 struts placed at thirds of span, and 3 feet long. Ends of girders capped with cast-iron blocks for seating the nuts of truss rods.

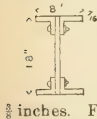
No. 17, a Howe Truss through; full covered, 73 feet span, 20 feet No. 17.  
depth, 7 panels, 14 feet clear width. Braces, 6 by 8; main tie rods, 2,  $1\frac{1}{8}$  inches. Trusses aided by added independent arches, made of 12, 2 by  $5\frac{1}{2}$ -inch plank sprung to the curve. The arches spring from iron stepped skewbacks 6 feet down on stone abutments, and rise in circles to 10 feet below upper chord. Floor beams, 8 by 14 inches; 5 to a panel.

A tunnel without number, 640 feet long; 24 feet wide; 22 feet high; Tunnel.  
lined with Ohio sandstone.

No. 18, an iron Pratt truss over Wills creek; span, 142 feet; No. 18  
height of truss, 24 feet; width, 16 feet. Made by Keystone Bridge Company. A curve of 4 degrees on bridge; 9 panels. Second main rods 2,  $1\frac{1}{8}$  by 3 inches. Lower chord, 4 panels, 4, 6 by  $\frac{7}{8}$  inches. Struts, Phoenix columns. End posts, 2 channel bars, 12 inches, by plate 16 by  $\frac{1}{8}$  inches on top, and plate  $\frac{1}{8}$  by 16 inches on under side.

Stringers built I-beam from plate-iron. Floor beams similar, but 24 inches deep, by 10 inches width, and web plate  $\frac{1}{2}$  inch. Main pins steel, 4 inches diameter. Ties 8 by 8 inches, 6 inches between; guard rail, 16 inches outside; curve on bridge, 4 degrees. Laterals of rods,  $1\frac{1}{2}$  inches diameter top and bottom. Expansion winter to summer, stated to be 3000 inches. Floor beams suspended, and stringers placed on top of them.

No. 19, a Howe through truss, full covered; over Wills creek. 9 No. 19.  
panels; span, 87 feet; depth, 19 feet; width, 14 feet. Braces, 7 by 9.

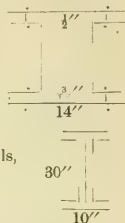


Main ties 2,  $1\frac{1}{2}$ . Chords, 6, 7, 7, 6 by 13; 12 years old. Trestle under 3 panel point. Ties, 6 by 8 inches, 6 inches between. Guard rail 6 by 8, notched and bolted, 15 inches outside from rails.

- No. 20. No. 20, iron Pratt through Keystone bridge, with a curve in the track. Span, 93 feet; depth of truss, 21 feet; width, 15 feet. Over Leather creek.

End post box, composed of channel bars and plates, thus:

All wrought iron.

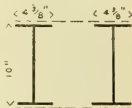


Panels, six. Main ties two,  $1\frac{1}{4}$  by 3 inches. Laterals,  $1\frac{1}{4}$  rods. Floor beams, thus:  
Stringers similar to beams, 18 by 8 inches.

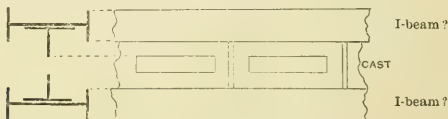
- No. 21. No. 21, a Howe through; full covered, wood truss. Span, 90 feet; panels, 9; 14 years old; depth of truss, 19 feet. Main braces, 8 by 9 inches. Counters, 8 by 8 inches. Main tie rods two,  $1\frac{1}{2}$  at end. Next, same. Lower chords 5, 6, 6, 5 by 13 inches. Laterals only at top 5 by 6 braces, and 1-inch rods. Floor beams, 7 and 8 by 14 inches. Bored with bit, and found all sound.

- No. 22. No. 22, a Howe through; full covered. Span, 85 feet; depth, 19 feet; width, 14 feet; over Leather creek. Age, 14 years. Bored, and sound. Curve in track. Lower chords, 5, 6, 6, 5 by 13 inches. 8 panels. Braces, 7 by 8. Main ties two,  $1\frac{1}{2}$  inches. Floor beams, 7 and 8 by 14 inches; 5 to the panel. A trestle bent under east quarter at second panel point.

- No. 23. No. 23, iron Pratt truss. Span, 98 feet; depth, 21 feet; width, 15 feet clear. Panels,  $5\frac{1}{2}$ . By the B. & O. R. R. Co. End posts, "latticed" or "laced." I-beams, thus:



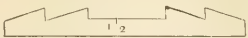
Intermediate columns or struts partly cast iron, thus:



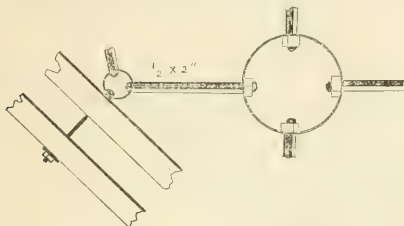
Main ties, first 2,  $1\frac{1}{2}$  by  $3\frac{1}{2}$  inches; second 2, 1 by 3 inches. Lower chords, first and second panels, two, 1 by 2 inches; third, three, 3 by 1 inches. Floor beams composed of two 14 by 5-inch I-beams, side by side.

- No. 24. No. 24, a Pratt Iron truss; span, 75 feet; depth, 21 feet; width, 15 feet. End posts of laced I-beams, as in No. 23. Lower chords at end, two, 1 by 3 inches; middle, two,  $1\frac{1}{4}$  by  $3\frac{1}{4}$  inches. 5 panels. Main tie, end, two, 1 by  $2\frac{1}{4}$  inches. Middle panels, two,  $1\frac{3}{8}$  by  $1\frac{3}{8}$  inches. Columns, two laced I-beams, each 6 by  $3\frac{1}{4}$  inches. Floor beams and stringers in one panel. Ties, 8 by 8 inches, 6 inches between.

No. 25, a half Howe Truss of wood. Trusses separately covered. **No. 25.** Span, 58 feet; depth, 9 feet; width, 14 feet clear; 10 panels. Bottom chords, 5, 10, 5 by 13 inches; middle stick spliced near middle of span

with two oak clamps, thus:  one on

each side. Braces, 6 by 8 inches. Main tie rods at end, two,  $1\frac{3}{4}$  inches. Floor beams, 8 by 13 inches, two to the panel. Laterals, flat iron, 2 by  $\frac{1}{2}$  inches, run from eyes, fastened into lower chords, to a ring at the middle of bridge width, four rods meeting in each ring, with a nut inside to draw tight, arranged as shown in sketch:



No. 26, a half Howe, with separately covered trusses, 50 feet span, **No. 26.** 9 feet depth, and 14 feet clear width. Panels, 8. Braces and rods, exactly as in No. 25; also laterals.

At Barnesville; a tunnel 310 feet long, 24 by 20 feet section, arched Tunnel. with Ohio sandstone; arch semicircular.

At Lewis Mill is an arch, 25 feet diameter, finely executed in cut A stone arch stone masonry. Built in 1871. Founded on bed-rock. From rock to springing of arch are four courses of stone,  $5\frac{1}{2}$  or 6 feet high. On these are planted the 27 voussoirs of a semicircular arch. Length of arch along the axis, 60 feet; wing walls plane, inclined  $30^\circ$  with axis of arch, and battered. Length of structure along the axis, including wing walls, 110 feet. All in fine condition.

No. 28, a deck Howe Truss, wood, with trusses covered separately. **No. 28.** Span, 60 feet; depth of truss, 12 feet. Sway braces in three sets, one at each end, and one in the middle. Truss timbers about like others of this span.

No. 29, a half Howe, through wooden truss with trusses separately **No. 29.** covered. Span, 65 feet; depth,  $9\frac{1}{2}$  feet; panels, 11; width, 14 feet. Bottom chords, 5, 6, 6, 5 by 13 inches. Braces, 8 by 8 inches. Main tie rods, first and second, two,  $1\frac{3}{4}$  inches. Floor beams, 8 by 13 feet, two to a panel. Track curved. Masonry good. Age 12 years.

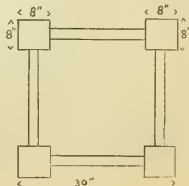
No. 30, a deck Howe, wood with trusses separately curved, and all **No. 30.** like No. 28. Sway braces at end and middle section, 3 sets.

No. 31, a through Howe, wooden, full covered. Span, 70 feet; depth, **No. 31.** 21 feet; width, 14 feet clear; panels, 7. Main rods, 3 sets, two,  $1\frac{1}{2}$  inches. Braces, 8 by 10 inches. Floor beams, 8 by 13 inches, 5 to the panel. Masonry excellent. Age 12 years. Ties and flooring about like others.

Between 31 and 32, a tunnel, timbered about 4 years ago with white **Tunnel.** oak.

- No. 32. No. 32, a through Howe, wooden truss. Independent arches added, one on each side of each truss, as in No. 16. Track curved on the bridge.
- No. 33. No. 33, an iron Pratt truss, same as No. 18; span, 82 feet; depth, 21 feet; with excellent stone abutments. McMahon's creek.
- No. 34. No. 34, a through Howe, full covered wooden truss; 11 years old. Span, 80 feet. 8 panels. Size of ties, braces, etc., as in No. 31. McMahon's creek.
- No. 35. No. 35, a through Howe, full covered wooden truss, of 87 feet span, and 14 feet clear width. Panels, 9. Abutments masonry. Trestle under bridge somewhat west of the middle. Sounded with a boring bit, and found the timber good.
- No. 36. No. 36, a through Howe, full covered, with a slight curve in track. Span, 90 feet; depth, 20 feet; width, 14 feet clear. Has 4 independent arches added, one to each side of each truss, as in No. 16. These spring from excellent stone abutments at points below wall plates. Members of the bridge same as in No. 31 over McMahon's creek. All from, and including No. 33 to Bellaire, are over McMahon's creek.
- Tunnel. A tunnel, 280 feet long, lined with timber.
- No. 37. No. 37, an iron Pratt truss by the Detroit Bridge Company. Span, 95 feet; width, 15 feet clear; depth, 20 feet. Lower chord at middle, 3 square rods,  $1\frac{3}{4}$  inches; panels, 6.
- 6 miles of narrow gauge. From Quincy Station to St. Clairsville, about 6 miles, a narrow gauge, 3 feet; operated by another company.
- No. 37. No. 37, a Howe through; full covered, wooden truss. Span, 110 feet; depth, 20 feet; width, 14 feet; panels, 10. Chords, 6, 7, 7, 6 by 13 inches. Ties, two,  $1\frac{3}{4}$  inches. Braces, 8 by 10. Flooring as in others. Guard rail secured by one bolt to each third tie. Curve in track, such that the versed sine for the bridge's length is 2 inches, or about a  $\frac{3}{4}$ -degree curve. Abutments, good; masonry walls, 4 feet thick. Trestle under bridge near the middle.
- No. 39. No. 39, a through Howe; full covered. Span, 120 feet; portals, 14 by 20 feet; panels, 11. Bottom chord, same as in 41 and 42. Braces, 8 by 10. Main ties, two, 2-inch clamps and keys at every panel. Floor beams usual size. New ones have been added recently, making 5 and 6 per panel. Track curved to about a 4-degree curve. Age 12 years. Bored, and found timber sound. A trestle bent support under west quarter of bridge.
- No. 40. No. 40, a Bollman iron truss, made by the B. & O. R. R. Company. Span, 110 feet; panels, 7; depth, 20 feet; clear width, 14 feet. Upper chords, 10 inches; hollow, octagonal tubes,  $\frac{3}{4}$ -inch thick, cast-iron. Truss columns 6-in. octagon tubes. End posts, thus:

Four bottom square cast-iron tubes joined by cross-stays at each 4 feet height, and inclined inward. Each post stands on a 4 feet cube of Cheat Mountain stone. Longest main rods, four,  $1\frac{1}{2}$  by  $\frac{1}{2}$  inches each truss. Next to the shortest two, 1 by 3. Laterals with 6 inches hollow cast-iron struts. Floor beams consist of 15-inch I-beams. The track-stringers same.





No. 41, a Howe through; wood. Span, 130 feet; panels, 12. Mc- No. 41.  
 Mahon's creek. Braces, 8 by 10. Chords, 6, 7, 7, 6 by 14 inches.  
 Clamps and keys at every panel. Main tie rods, two, 2 inches, and one  
 1½ inches. Floor beams, 7 and 8 by 14 inches; 5 to the panel. Ties, 6  
 by 8 inches, 8 inches between. Guard rail, 10 inches out from rails;  
 bolt every second tie. One trestle bent at east quarter.

No. 42, a Howe through; wooden bridge. Span, 150 feet; with No. 42.  
 portals 14 by 20 feet; panels, 12. Lower chords, 6, 7, 7, 6 inches, 14 feet,  
 with clamps and splice for one stick at each panel. Braces, 8 by 10.  
 Main tie rods, two, 2 inches, and two, 1¾ inches at end of bridge.  
 Lateral ties, 1½ inches at top and bottom. Ties, 6 by 8 inches, 8 inches  
 between. Guard rails, 10 inches outside, with bolt at every second tie.  
 A trestle support under the west quarter.

East approach to No. 42 a tunnel, 480 feet long, not timbered nor Tunnel.  
 arched. The native rock firm.

No. 43, a through Howe; full covered, wooden truss. Span, 116 No. 43.  
 feet; depth, 20 feet; width, 14 feet; panels, 11. Trusses supported with  
 four independent arches, rising from the abutments to ¾ the height of  
 the trusses. Main braces, 8 by 10 at end. Tie rods, two, 2 inches.  
 Floor beams, 5 to a panel. Masonry abutments good, with concave  
 wing walls.

No. 44, a through Howe; full covered wooden bridge. Span, 130 No. 44.  
 feet; depth of truss, 20 feet; width, 14 feet. Trusses supported with  
 four independent arches, composed each of 12 pieces of 2 by 5½ inches  
 plank sprung to the curve. Bottom chords, 6, 6, 6, 6 by 14 inches, clamps  
 and splice at each panel, clamp with 1½-inch necks. Main ties, two, 1½  
 and one 1½ inches. Braces, 8 by 10 inches. Floor beams, 8 by 14 inches;  
 5 to the panel. Stringers, 8 by 12 inches. Ties, 6 by 8 inches, 8 inches  
 between. McMahan's creek.

At the Ohio river the Virginia State line lies at the west shore line. Ohio river—  
 A long iron bridge of several spans crosses the river, with a long via- Bellaire.  
 duct of stone arches for a west approach, or from the Ohio side. The  
 shore line is passed by the first two bridge spans of iron deck Bollman  
 trusses, made by the B. & O. R. R. Co., 100 feet each span. These stand  
 on piers of excellent stone masonry. The west pier, or abutment being  
 the most easterly pier or abutment of the stone viaduct, this being much  
 heavier than the other viaduct piers—a T of 20 feet extent.

Viaduct arches, semicircular, 28 feet diameter inside, with voussoirs Viaduct.  
 of about 24 feet depth and 36 in number, besides the keystone. The  
 latter is 4 or 6 inches deeper than the voussoirs. The piers, 6½ by 12  
 feet at the ground, rising with a batter of 1 inch to the foot, to the spring-  
 ing 12 feet high. Whole height of viaduct, 32 feet. Coping consists of  
 two courses, about 14 inches thick, each set out about 4 inches. Width  
 across the top, including copings, 12 feet. Whole number of arches, 37,  
 17 of them at west end being set to a 4-degree curve of track. Between  
 the lower course of coping and the keystone is a course of about 18  
 inches.

Joint lines all appear perfectly straight along the length, the cut  
 stone masonry being in excellent condition, the viaduct being a remark-  
 ably fine and beautiful structure, built in 1870.

The viaduct and all parts of this bridge are the property of the Main  
 Line of the Virginia and Maryland Railway.

## GENERAL REMARKS.

Remarks.	On this division of the B. & O. R. R. many things are adopted as standard, and practice made to conform with the standards as nearly as consistent with local demands. For instance, the standard wall plate for a bridge is composed of two oak sticks 12 by 12 inches-square, and changed every 4 or 5 years. This short life is required of these blocks because of their importance, the frequent replacing of them having the object of avoiding rotting and crushing and canting of the bridge. The ends of these wall plate blocks are beveled at an angle of 30 to 40 degrees from near the bearing of bridge, so that water will run away. These are used under all wooden bridges, and iron ones where they are suitable. This road prefers to have some wood bearing at bridge seats, apparently for two reasons; 1st, to give a degree of elasticity at the seat that would not be required by planting directly on stone, and 2nd, to supply a slightly yielding material, so that a good bearing will be got between the surfaces, such as will not permit of slipping or creeping. Some fine iron culverts of 10 ft. span or less, composed of I-beams, stayed with cast iron packing and lateral tie rods, have wall plates of the above blocks.
Standard wall plate.	
Bridge floor'g.	Another standard is bridge flooring, consisting about as follows: ties, 6 by 8 inches, placed 6 inches between; wooden guard rail, 6 by 8 inches, spliced and beveled, placed about 15 inches outside of the rails, and bolted every 2nd to 4th tie.
Ties.	Also, ties for track, the standard number is stated to be 3,000 to the mile for this division; all good Rails, 60 pounds to the yard—steel.
Joints.	Fastenings mostly angle bar. Have few of Samson's. Near stations, where speed is slow, as was seen at Zanesville, a few of the old Trimble joint fastenings are still in use.
Grades.	On this division the maximum grade is stated to be 85 feet to the mile. Maximum degree of curves, about 6 degrees. Elevation of outer
Rail elevation	rail on curves, $\frac{3}{4}$ inches per degree to 3 degrees. From 3 to 6 degrees, $\frac{1}{2}$ -inch per degree is allowed. No attention paid to controlling maximum grade per division. At each point the grade was made the mildest consistent with cost. Neither does it appear that attention has been given to grade compensation for curvature.
Abutments.	On this division all bridge abutments are of stone, which have been found so uniformly excellent in condition, that notes have not been entered concerning them in the above, except occasionally. No. 9 is the only one found without cut stone abutments. Wall plates are in exceptionally fine condition. In the few instances that ants were found at work in the wall plate blocks, common salt was found sprinkled about for driving them off.
Ants.	
Pins.	All iron bridges on this division are framed with pin bearings, the pins being steel. Cast iron is found in no important parts of the iron bridges for a main reliance, except in the upper chords, end posts and columns of Bollman trusses. All iron bridges are well painted.
Cast iron	
Bridge doctors.	The wooden bridges are apparently very carefully looked after, no defects having been found. It was gratifying to find every weakness which appeared possible to develop in a bridge provided for even in advance. Thus independent arches are frequently found added for strengthening a bridge too good to be soon removed. The poorer wooden bridges have promptly been provided with trestle bents, one or

more placed under at the thirds or quarters, to give ample security till such bridges could be replaced by iron ones, the latter being apparently eagerly sought after by the road-master.

The stone work of this division is mostly of what the road-master terms Ohio sandstone. The road-master states that this stone is apt to be soft and too easily disintegrated for good work. Hence, care is needed in selecting quarries to insure a good durable quality of stone. This stone is rejected for ballast. Selecting quarries.

At one point on this division a high embankment gave trouble in spreading out at the base, caused by springs of water underneath, and a too great weight of embankment. The difficulty was cured by putting on the upper 10 or 12 feet of the fill, at the failing point, coal slack from a mine near by. The diminished weight, due to the lesser specific gravity, being sufficient for the unstable bed. Slip sides.

A considerable portion of the ballast of the roadway on this division is stone. From Cambridge to Bellaire, a distance of 50 miles, it is almost entirely of stone. Stone ballast.

The embankments are topped out not less than 14 feet wide, and it is often made 20 feet to dispose of dirt in a useful way. Embankments.

In the hilly country of South-eastern Ohio this road has numerous deep cuts, many of them liable to drop stones and masses of dirt. Men are stationed in these cuts on watch, night and day, provided with a watch-house, in which is stored the means for ridding the track of passable lodgments, such as flags, lanterns, spades, bars, jumper drill, powder, fuse, etc. In long cuts on curves a man is stationed at each end. In emergencies the men combine from the neighboring cuts to hurry off big stones, etc. In case of a downfall upon the track, flags or lanterns are hurried out to signal danger to trains. Dangerous cuts.

In case of such danger signals as the above, or at other unusual signaling points, as in the repair of roads, a stake flag, or hanging lantern is not depended on. The signal must be a living one, a man with the flag or lantern. Living danger signals.

The minor structures of this division, such as cattle guards, culverts, etc., are all in excellent condition, as well as the roadway, track, switches, etc. Everything considered, this division is to be regarded as in excellent condition. Minor structures.

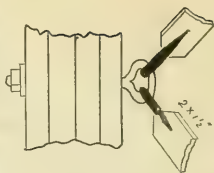
In all the above, where dimensions have been given for trusses as for tie rods, etc., they belong to one truss only. The complete section areas for whole bridge, due to such parts, are to be doubled as obtained from the single truss figures given. Total section areas.

## 2. Sandusky, Mansfield and Newark Railroad—"Lake Erie Division"—from Newark to Sandusky, inspected on July 20, and on September 16, 1881.

On this division bridges and trestles are numbered in order from Newark to Sandusky.

No. 1, at Newark, over the Ohio canal. A through half Howe; wooden truss, with trusses separately covered. Span, 63 feet; depth of truss, 9 feet; width, 15 feet; panels, 11; speed slow near station. Age 5 years. Lower chords, 5, 5½, 5½, 5 by 12 inches, with keys, but no clamps. One No. at Newark.

splice at alternate panels throughout. Braces, 7 by 9 inches. Main ties, two,  $1\frac{1}{2}$  inches. Sharp curve in track. Floor beams notched and suspended to lower side of chords with two bolts at each end of a floor beam. Laterals as sketched; flat iron ties,  $\frac{1}{2}$  by 2 inches, from eye bolt in chord to a ring in middle of bridge width, where 4 ties center, and can be drawn up by nuts. These laterals were

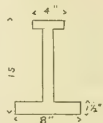


loose, and as a train went over the bridge swayed in consequence. The notched floor beams served for the struts. The chord members were loose also, with spaces of  $\frac{1}{4}$  to  $\frac{1}{2}$ -inch, needing to be drawn up by the chord bolts. Abutments of timber. Framed trestles with planks behind, against which the earth approaches rest. The height of the trestles is about 8 feet, with five 12 by 12-inch plumb posts, two 8 by 12-inch batter posts; a 12 by 12-inch cap and mud-sills. This bridge evidently has not received the attention that others have, probably because located where speed is slow, and danger slight, comparatively.

Nos. 2 to 7, inclusive, are culverts and trestles of 15 feet span and less; passed without stopping.

No. 8.

No. 8, an iron deck Bollman of 80 feet span, 6 panels, 13 feet depth of truss, and 11 feet width. Construction much like that over Salt creek. Middle tie rod,  $\frac{5}{8}$  by  $2\frac{1}{2}$  inches. Top chord, 8 inches, octagon tube. Lateral ties, 1 inch, top and bottom. Floor beams cast, as shown in sketch. Stringers, two, 6 by 16 inches. Ties, 6 by 8 inches, 8 inches between. Guard rail, 15 inches out.



No. 10.

No. 10, a trestle of 9 openings, each 22 feet, c to c. Bolsters, 10 feet long; stringers, three, 8 by 18 inches. This to be renewed this season, with 14 feet spans in clear; and ties, 6 by 8 inches, 8 inches between, etc., to standard. The present is sap-rotted, and considerably weakened with age.

No. 13, north part.

No. 13, a Howe through, of 67 feet span for the north part, or north span. Panels, 12; width, 14 feet; depth of truss, 10 feet. Not covered. Lower chords, 5, 6, 6, 5 by 12 inches; braces,  $6\frac{1}{2}$  by  $8\frac{1}{2}$  inches; ties at end, two,  $1\frac{1}{2}$  inches; laterals,  $\frac{1}{2}$  by 2 inches, flat with eye-bolt and ring, as in No. 1. Built with no clamps in lower chord, simply keys. Supported by two trestles placed under. All wood.

South part.

The south span a through Howe, wood, full covered. Length, 103 feet; depth, 20 feet; width, 14 feet; ties, two,  $1\frac{1}{2}$ , and one  $1\frac{1}{4}$  inches. Braces,  $6\frac{1}{2}$  by  $8\frac{1}{2}$  inches; panels, 10; lower chords,  $4\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $4\frac{1}{2}$  by 12 inches, with no clamps; stringers, 12 by 12 inches. One supporting trestle in the center.

No. 14.

No. 14, a trestle, 12 feet high, with 15 feet spans, c. to c. Stringers, three, 6 by 16 inches sticks at each rail; 2 plumb posts, 12 by 12 inches; 2 batter posts, 10 by 12 inches; caps, 12 by 14 inches; all 3 years old.

No. 15.

No. 15, a four-bent trestle, 3 years old, 6 feet high; span, 14 feet; stringers, two, 6 by 16 inches; trestle caps, 12 by 15 inches; plumb posts, 12 by 12 inches; batter posts, 6 by 12 inches; ties, 6 by 8 inches, 9 inches between.

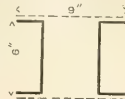
Nos. 16 and 17, small trestle, of 3 openings each; 3 and 5 years old, Nos. 16 and 17. respectively. Bored, and found timber sound.

No. 18, a through Howe, full covered wood truss. Roof defective. No. 18, east part.  
Span, 120 feet; depth, 21 feet; width, 14 feet. Trestle bent under near middle for support. Age 10 years. Is to be replaced by an iron truss in one or two years.

West part an uncovered Howe truss; 7 years old; like one part of No. 13. Trestle bent under middle. Floor beams, 8 by 14 inches, 2 to a panel. Panels, 12; ties, 6 by 8 inches, 6 inches between. This 6 inches space between ties preferred by road-master, because for close ties of 2 inches space, horses are sometimes driven across.

No. 19, a two span Pratt truss bridge, by the Detroit Bridge Com- No. 19.  
pany, in 1878. Each span, 105 feet; depth, 21 feet; width, 15 feet clear; panels, 7. Lower chords at middle, two,  $1\frac{1}{8}$  inches square, and one,  $2\frac{1}{2}$  inches square. Main tie rods, two, 2 inches square. Columns, laced channel bars.

Channel bars,  $\frac{3}{8}$ -inch thick in web, for the columns at the middle panel. Floor beams suspended.



Stringers, thus:

End post and top chord as in sketch:

Lower lateral ties,  $1\frac{1}{2}$  inches; upper,  $1\frac{1}{4}$  inches. Main pin,  $3\frac{1}{2}$  inches; others, 3 inches. Middle of the bridge anchored down to the central pier. Ties, 8 by 10 inches, 8 inches between. Ribbons notched, but as usual. Over Dry creek.



At Utica, Ohio, a fine cut stone arched culvert of 10 feet diameter, Arch. made in 1872.

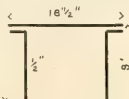
No. 21, a queen-post inverted truss of 32 feet span, resting on trestle No. 21. bents near banks, with short bank spans; age one year. Same construction as No. 177, near Sandusky, for the inverted queen-post.

Nos. 22 to 34, inclusive, small openings.

No. 35, a through Pratt truss of 120 feet span. 24 feet depth; width, No. 35. 14 feet;  $8\frac{1}{2}$  panels. Over Dry creek. By the Detroit Bridge Company,

End posts as sketched:

Top chord somewhat wider. Truss columns, 8 by 12 inches, laced channel bars. Lower chord, panel adjoining middle, four,  $\frac{1}{8}$  by 4 inches. Main tie rods, end, two,  $1\frac{1}{8}$  by 4. Floor beams composed of two, 5 by 14-inch I-beams, side by side. Stringers, like-



wise,  $4\frac{1}{2}$  by 12 inches. Strut piece below, in lateral system a  $3\frac{1}{2}$  by 9-inch I-beam. Pins, 3 inches. Floor beams and stringers in one plane.

No. 36. No. 36, a through iron Pratt truss bridge of 2 spans, of 120 feet each, over Owl creek, going up. Materials on the ground. Made by the Keystone Bridge Company. Track curved.

No. 37. No. 37, a stone arch of 20 feet diameter, in town of Mt. Vernon, over a mill race.

No. 39. No. 39, a half Howe through; wooden truss of 43 feet span. 9 feet depth of truss; 14 feet width; 5 years old. Over mill race. Chords, all in one piece, without splice,  $4\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $4\frac{1}{2}$  by 12 inches; upper,  $9\frac{1}{2}$  inches. Braces,  $6\frac{1}{2}$  by 9 inches. Tie rods, two,  $1\frac{1}{2}$  inches; 6 panels. Floor beams, 8 by 14; 2 and 3 per panel, with stone abutments.

No. 40, a small trestle.

No. 41, Howe. No. 41, a through full covered wooden Howe truss. Span, 130 feet; depth, 20 feet; panels, 12. Lower chords, 6, 7, 7, 6 by 13 inches. No clamps. Keys of iron, and so made as to displace the clamps, the keys serving the ends required of the clamps.

Keys, thus:

Braces,  $7\frac{1}{2}$  by 10. Main ties, two,  $1\frac{3}{4}$ , and one,  $1\frac{3}{4}$ . Laterals, 6 by 6 inches, and  $1\frac{1}{2}$ -inch rods, top and bottom. Floor beams, 8 by 14 inches; 5 to the panel. Stringers, 12 by 12 inches. Ties, 6 by 8 inches, by 8 inches between. Guard rails, 6 by 8 inches, notched upon ties, and bolted. Trestle support under, at one panel, west of the middle. Roof somewhat leaky. Bored with bit, and found no rot.



No. 42, at Fredericktown, small opening.

No. 43, Howe. No. 43, a through full covered wood Howe truss. Two spans of 100 feet each. Nearly new. Clamps and keys all painted, and laid in white lead. Clamps,  $1\frac{1}{2}$ -inch necks. Chords,  $4\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $4\frac{1}{2}$  by 12 inches. Braces, 7 by 9. Ties, two,  $1\frac{1}{2}$  inches at end of truss. Panels, 7. Height of truss, 20 feet; width, 14 feet. Clamps at every panel. Floor beams, 8 by 13 inches; 5 to each panel, some of them recently put in. Stringers, 10 by 12. Guard rails bolted at every fourth tie. Abutments, masonry.

No. 44, a trussed girder, like No. 177, near Sandusky; 1 year old.

No. 46, a 3-span trestle; age 7 years. There are two trestle bents, one on each side of the center springs, supporting the middle span; and a bank-span on either side, making the three spans. Stringers at each rail, 6, 6, 6 by 18 inches. These rest on the two trestles and the banks. The ends at bank have plates or blocks under 3 feet deep, so as to give a somewhat extended bearing on the top of banks. The banks terminate in slopes toward the center opening. The bank-sills are somewhat decayed, as well as other timbers. But the timbers are of large size, so that the trestle is safe. Numerous small openings, like No. 46, and smaller, between 46 and 74.

No. 74. No. 74, an iron Pratt truss, like that at Mt. Vernon, now going up; 2 spans. East one, 90 feet; west one, 80 feet; depth, 24 feet; width, clear, 15 feet. Masonry fine. Made by the Clark Bridge Company of Baltimore. Over the Mohican creek.

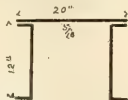
No. 75. No. 75, a 2-span Pratt truss, of 105 feet each span. Depth of truss, 20 feet; width, clear, 15 feet. By the Detroit Bridge Company, built in



1878. Bottom chord, at middle, two, 2 inches square, and one, 2½ inches square. Main ties, at end of truss, two, 2 inches square. Loop-eyes: Pins, 3 inches.

End posts, thus:

Curve in track.



No. 83, a 2-span Pratt Truss of 65 feet each span, now going up. No. 83.  
Depth of truss, 20 feet; width, 15 feet. Masonry all new and good.  
Over North Fork of the Mohican. By the Clark Bridge Co.

No. 84, a 6-span trestle, built in 1880. Over Lundy's mill-race. No. 84.

At Mansfield a through Howe, wood, well covered separately.  
Span, 75 feet; depth, 10 feet; width, 14 feet clear; panels, 12; chords, 5, 6, 6, 5 by 14 inches; braces, 7 by 9½ inches; main ties, two 1¾ inches; floor beams, 8 by 14 inches, 3 to a panel; stringers, 8 by 12 inches. Stone abutments excellent.

Nos. 119 to 143, inclusive, small structures; passed, without stopping train.

No. 144, a through Howe Truss of 6 feet span, 9 feet depth, 14 feet No. 144.  
width; 12 panels. Trusses covered separately; age, 7 or 8 years; flooring, standard, all in good condition.

No. 145, a girder.

No. 150, girder over road. Span 20 feet, 5 years old, with bank spans over sloping bank terminals.

#### *Plymouth.*

No. 153, a pile trestle 10 feet high. Piles driven 10 feet to hardpan. Piles, round, white oak logs, 12 inches. Caps, 12 by 12-inch oak. Flooring, standard, except ties, 10 inches between.

#### *Chicago Junction.*

No. 160, a 5 or 6-span trestle 10 feet high.

No. 163, a deck Howe, wood, 7 years old, located ½-mile from Pontiac. Well covered; 15 or 20 feet above stream.

No. 168, a 5 span trestle, 32 feet high above stream at Monroeville. No. 168.  
Plumb posts, 12 by 12 inches; batter posts, 10 or 12 by 12 inches; caps and mud-sills, 12 by 14 inches. A cross stay at about mid-height of trestle, and also longitudinal stays or "wulings." A Lorenz safety switch at head of trestle. Stone abutments extended into wing walls. Ties, 6 by 8 inches, 16 inches c. to c. A wood guard rail outside of rails, bolted.

No. 177, a trussed girder, or more strictly an inverted queen-post No. 177.  
truss. Length, 32½ feet. Stringers, three 5¾ by 15¾ inches, dressed. Queen-post struts, 3 feet 9 inches, wood, with iron foot plates at bottom end. The tie rods extend to ends of the stringers, upper corners, where cast iron plates or blocks are fitted to receive the ends of tie rods. Middle tie rods, eye bars, four, ¾ by 3 inches; end two, 1½ by 3 inches, with eyes at inner ends. The foot plates receive the pins as well as the eyes of bars. Pins, 2½ inches.



The lateral system has foot-plates with spurs let into inner sides of stringers, and with lugs for the braces to toe against.

About 3 miles from Sandusky, stone abutments. All parts of structure in excellent condition.

#### GENERAL REMARKS.

Small structures, such as trestles of 2 or 3 openings, and culverts, very numerous on this division. Many small trestles have no abutments, the banks sloping toward the center. An extended bearing on the banks is secured by bedding timbers, sometimes a solid course of ties on the tops of the banks. On these the wall plates or sills are laid, for receiving the ends of the main stringers. These often settle apparently, when blocks are placed under to fill up. When the blocking amounts to a large 12-inch block or sill, the small blocks are replaced by the large one.

Near Sandusky is found a stretch of several miles of stone ballast, otherwise it is mostly gravel on this division. From Newark to Chicago Junction the rails are mostly steel, and stated, would be all steel complete by August 15. From Chicago Junction to Sandusky rails mostly iron and of old form of section, and such as do not hold fish-plates well. The concave sides of the rails are approximate half cylinders, instead of having angular grooves with nearly square shoulders for holding the fastenings.

Ties in good condition throughout.

Cattle guards and small structures good.

Important bridges all have stone abutments.

The road from Newark to Chicago Junction in better condition than that north of the latter place. The former excellent. The latter good and safe.

3. Baltimore and Ohio and Chicago Railroad, part of the "Chicago Division," lying between Chicago Junction and the State Line, west; inspected July 21, 1882.

On this division structures are numbered in order, from Chicago Junction west.

Nos. 1 to 5 very small openings.

No. 5.

No. 5, a 11-bent trestle. The trestle sides raised upon blocks.

Nos. 6 to 30 very small, the largest being No. 12, of 6 spans. Average, about 3 spans. Height above bed of channel about an average of 6 feet.

No. 30.

No. 30; stopped at this to get an average idea of the others. This opening has one central trestle bent, with stringers over, continuous from bank to bank. Banks slope toward trestle bent without abutments. Stringers rest on bank sills at their ends. Stringers blocked up on super added blocks, probably due to raising of grade here. Mud-sill of trestle bent sunk into ground. Stringers under each rail, three 6 by 16 inches, by 18 feet length. Ties, about 8 by 8 inches and 20 inches apart. Guard rails 6 by 8 inches, bolted every 2 or 3 ties. Age, 7 years. Appears to be in fair condition, and safe.

Nos. 30 to 46 all small, and not stopped at.

No. 46, examined. Three trestle bents and 4 spans—two central, and two bank spans. The two central ones measure 28 feet, or 14 feet each.

Trestle bents as sketched. Parts, 4, all equally inclined. Mud-sills are below surface of earth.

Stringers, two  $8\frac{1}{2}$  by 15 inches. Bank sills are blocks one under each of the ends of the string combination. These blocks look to be in poor condition, partially decayed. Guard rails, 5 by 6 inches, poor. Built in 1874. This structure is in a more critical condition than the average, though the principal parts, viz.: the trestle bents and the stringers, are in fair condition of strength.

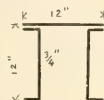
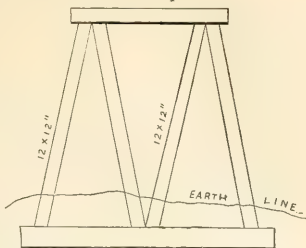
No. 59, examined. Small, like No. 30. Single stringer length, and central trestle bent. Stringers, three, 6 by 16 inches, by 18 feet length. Trestle bent all good but cap, and that to be renewed soon. Also. bank sills are bad; orders already given for repairing these. Standard 12 by 12-inch bank sills ordered in, which will make all safe.

No. 63, at Tiffin, O., a 2-span Pratt Truss, with double track, by the Baltimore Bridge Co. Spans, each 115 feet; width, 26 feet clear; depth of truss 24 feet to lower laterals and 6 feet above, making 30 feet total depth of truss. Within this, 6 feet at top, is a system of sway bracing, and two systems of lateral bracing. The horizontal struts to these systems, going crosswise, are each of 2 channel bars 10 inches apart at center one over the other, and stayed at numerous points. The sway tie rods are  $1\frac{1}{2}$  inches in diameter, a set at alternate panels. Lateral tie rods in top systems,  $1\frac{1}{4}$  inches. Lower laterals in floor,  $1\frac{3}{8}$  inches. These lateral systems cross the entire width of bridge.

End posts as sketched. Pins, 3 inches. Lower chords at the middle, four, 5 by  $1\frac{1}{4}$  inches. Second main tie rods, two, 4 by  $1\frac{3}{8}$  inches.

Bridge truss columns as sketched, 6 by 9 $\frac{1}{2}$  inches, consisting of an I-beam and two channel bars, riveted on with flanges outward.

Floor beams trussed with two,  $1\frac{1}{4}$  by 5-inch bars, the beam being as sketched. Stringers, wood, three, 6 by 14 inches. Ties, bad, but are to be renewed soon.



No. 63, Pratt Truss.

East approach two 25-foot spans of girder, double track. Girders, 5 by 14-inches. I-beams with two  $\frac{5}{8}$  by 10 inches lifts, riveted on at middle. Over struts

West approach also over struts, and supported by girder, made as those at east approach.

Masonry foundations of all these parts of No. 63 excellent.

No. 64.

No. 64, a 12-span trestle; largest near here. Found badly decayed in places, but is being repaired. The fact of these repairs indicates that the structure is receiving the attention needed. Some posts are rotted about half off at the mud-sills. Trestle believed to have sufficient strength to be safe at present.

No. 68.

No. 68, east part, 3 spans, of 47 feet each, of deck Pratt truss; 4 panels; 9 feet height of truss. Upper chord, 5 by 15 inches I-beam, by  $\frac{3}{4}$ -inch thickness of web. Lower chords at middle, two, 1 by 3 inches. Main ties at end, two,  $1\frac{1}{4}$  by  $3\frac{1}{2}$  inches. Laterals,  $1\frac{1}{4}$  inches. Sways,  $1\frac{1}{4}$  inches. Struts Phoenix columns. Set on good masonry piers.

West part; 12 spans of trestle, rather doubtful for age. Is to be filled with an embankment within a year.

No. 81, an 8-span trestle.

No. —, a 37-span trestle, just west of Fostoria. About 8 feet high above channel bed. Looks old, and in need of repairs. Will be filled soon, except about a 12 feet opening.

No. 88.

No. 88, a 21-span trestle, of about 12 feet each span; built in 1874, and weak from age. But the timbers are extra heavy, thus insuring safety.

Between Nos. 94 and 95, Bairdstown.

No. 97, a 15-bent trestle, just repaired, and made safe, as stated by roadmaster.

No. 113, a 7-bent trestle, repaired last week.

No. 117, now at repairs.

Deshler follows No. 119.

Holgate follows No. 132.

Defiance follows No. 140.

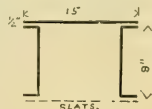
No. 141.

No. 141, at Defiance, a deck Bollman of 3 spans, of 140 feet each; depth of truss, 18 feet; width, 20 feet; made for two tracks; built by the B. & O. R. R. Co. Upper chord a 10-inch octagonal tube of cast iron; end pins,  $2\frac{1}{4}$ -inch steel; longest rods, one,  $1\frac{1}{2}$  by 1 inches, one,  $1\frac{3}{4}$  by  $\frac{3}{4}$  inches, and rod, 3 by 1 inches, going to sixth panels. Rods to center of bridge,  $3\frac{3}{8}$  by 1 inches. 8 panel Floor beams composed of three I-beams, as sketched. Stringers, two, 5 by 12 inches; I-beams,  $\frac{3}{4}$ -inch webs; laterals  $1\frac{1}{8}$  inches; top and bottom with cruciform stays, 5 by 5 inches; ties, 8 by 8 inches by 13 feet, 8 inches between. Guard rails 3 feet 4 inches out.



West approach a trestle 1100 feet long, being filled with a steam shovel.

No. 142, a through Pratt truss of 125 feet span; by the Keystone Bridge Co. 20 feet depth of truss, and  $14\frac{1}{2}$  feet wide. 8 panels. End post as sketched. Lower chords at middle, two, 1 by 6 inches, and two,  $\frac{5}{8}$  by 6 inches. Main end ties, two, 1 by  $5\frac{1}{2}$  inches. Floor beams, two,  $5\frac{1}{2}$  by 15-inch I-beams. Stringers in same plane as the floor beams.



West approach a trestle, which will be filled soon.

No. 147, a 20-bent trestle, about 20 feet high. Carpenters at work repairing.

No. 150, a through 3-span Pratt truss, by the Keystone Bridge Co. No. 150. Single track. Spans, 154 feet each. End posts, two channel bars and plate,  $9\frac{1}{2}$  by 14 inches; plate,  $\frac{1}{2}$  inch thick; depth of truss, 20 feet; width, 14 feet; panels, 9; lower chords, four, 1 by 6 inches; main tie rods at end, two,  $1\frac{3}{8}$  by  $5\frac{1}{2}$  inches. Floor beams, two channel bars, 10 by  $2\frac{1}{2}$  inches, trussed by one 6 by  $1\frac{1}{16}$  bar. Truss columns are swelled Phoenix columns. Ties, 8 by 8 inches, 12 inches between. Stringers wood, but soon to be renewed in iron. End pins,  $3\frac{1}{2}$  inches diameter. Built in 1874.

#### GENERAL REMARKS.

The great number of structures on this part of this division, viz., about 150, are mostly very small and of wood. The small ones have but little stone work. Stone quarries not as plenty here as in the Central Ohio Division. The country is much more flat. Though the small structures are not of costly construction, they are safe, and generally good. The larger structures are iron, and of the best kind, with good stone foundations.

4. Newark, Somerset and Straitsville Railroad—the "Straitsville Branch" extending from Newark to Shawnee. Inspected September, 1881.

On this division the bridges and trestles are numbered in separate series, both beginning at Newark.

No. 1, a through Howe, full covered bridge of wood. Span, 112 feet; No. 1, Howe. 10 panels, 21 feet depth of truss. Braces, 7 by 9 inches; main ties, three,  $1\frac{1}{2}$  inches at end, upset for threads; lower chords, 5, 6, 6, 5 by 14 inches; laterals, 6 by 6 inches, and  $1\frac{1}{2}$  inches, top and bottom; floor beams, 6 by 12 inches, 5 to the panel; stringers, 9 by 12 inches; flooring ties, 6 by 8 inches, flatwise, 8 inches apart, notched on stringers. Guard rails, 6 by 8 inches, flatwise, notched and bolted. Chords have oak clamps and keys. A pile trestle under each quarter. Masonry abutments good and sound. Bridge lined inside as far as the first counterbrace. The flooring in this bridge is of materials and dimensions called standard flooring. Over Raccoon creek.

No. 2, a through Howe, full covered. Span, 112 feet; height of truss, No. 2, Howe. 21 feet; 10 panels; main tie rods, three,  $1\frac{1}{2}$  inches, at end of bridge; laterals, same as in No. 1, also chords; floor beams, 8 by 13 inches, 4 to a panel; stringers, 8 by 10 inches. Five strips for covering, nailed on chords. An open space at each panel over the top of side covering, under eaves of roof, made for ventilation. Pile trestle under, for support, placed two panels from center north.

The south approach of No. 2, Howe truss, is a trestle of 20 spans, 14 feet, c. to c. Near the south end of this trestle are two inverted queen-post trusses, or trussed girders of 32 feet span each, one being exactly like No. 177, near Sandusky; Lake Erie Division; and the other with truss rods, two, 2 inches. Trestle ends at bank without abutment.

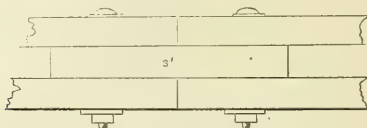
Sill, or bank-plate, 12 by 12 inches, laid on a bed of ties, placed lengthwise on bank, and touching sidewise.

No. 2, trestle. No. 2, a trestle of 3 main spans, of 14 feet each, and the two bank spans.

No. 3. No. 3, a trestle, 10 feet high, one main span of 14 feet, and 2 bank spans. Rebuilt in 1879.

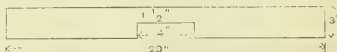
No. 4, trestle, burned a year ago, and now new.

No. 13, trestle. No. 13, trestle over Greenford creek; 12 feet high, 10 feet spans; stringers, two, 7 by 15 inches, under each rail, and one span in length. A wood packing piece, 3 feet long, is placed between the string pieces at the abutting points on trestles, and serves as a splice. Bolts near ends of stringers go through this packing piece, one bolt each side of the butt joint, thus:



Abutments stone wall, laid dry. The north wall is standing well, but the south one is failing, and a trestle bent is placed close to it for aid. The trestles are framed. Plumb posts, 12 by 12 inches, and bolted, posts, 9 by 12 inches, toed into plumb posts, a foot or two below caps. Caps, 12 by 14 inches, by 12 feet long. Mud-sills buried. Part of the bents are sunk 10 or 12 inches deep at channel bed, by washing and softening of bed. Stones are piled in about the old trestles thus sunken, and new trestles built up with caps of former trestles as mud-sills. A longitudinal stay, 4 by 6 inches, runs from cap to cap between stringers.

No. 3, Howe. No. 3, Howe truss bridge, through, full covered; span, 97 feet; height, 20 feet; 8 panels; lower chord, 5, 6, 6, 5 by 12 inches; clamps



and keys of oak; end braces, 7 by 9 inches; main ties at end of truss, two,  $1\frac{1}{2}$  inches. Floor beams, 8 by 13 inches, 4 to the panel, suspended by two  $\frac{3}{4}$ -inch bolts and cross bar of oak, 2 by 5 inches, washers, 4 inches diameter, above and under, notched to chords, thus serving for lateral struts. Lateral ties,  $\frac{1}{2}$  by 2 inches, with eye bolt at chord, and ring at middle, as in other cases described. Top laterals, 6 by 6 inches, and  $1\frac{1}{8}$  inches. Ties, 20 inches, c. to c. Guard rails, 4 by 6 inches, bolted.

Bottom chord renewed 4 years ago. Abutments two framed trestles, 3 feet apart each; planks spiked on, with small spaces between, to ward off flood-wood. Also wooden wing fenders, to control drifts.

No. 15, small trestle. No. 15, small trestle 4 years old; 4 full openings and 2 bank spans.

No. 17. No. 17, a trussed girder 32 feet span, like No. 177, near Sandusky.

No. 21, trestle. No. 21, trestle, near Somerset, north, 25 bents, 14 feet 8 inches each span. Being filled, and probably will be filled to 12 openings within a year. Stringers, two, 7 by 15 inches; bolsters, 10 feet long; bolt through one stringer and bolster ends; timber stringers in single span lengths;

bents, 20 to 30 feet high, and have cross and longitudinal stays at mid-height.

No. 23, trestle, 34 bents, 36½ feet high at highest point. Bents, two No. 23, trestle. plumb posts 12 by 12 inches; 2 batter posts 12 by 12 inches, reaching up to and toeing against cap; 2 batter posts 10 by 12 to mid-height of plumb posts, and all with cross and longitudinal stays at mid-height; cap, 12 by 12 inches; mud-sills; occasionally a longitudinal brace from foot of the trestle to mid-height of next, and thence to cap of second. Bolsters, 10 feet long, and bolt at each end through stringer. Stringer timbers, two, 7 by 15 inches, with length, span, 14 feet 8 inches. Ties, 6 by 8 inches, 9 feet long, the standard length. Guard rails, 6 by 8 and 9 inches outside.

Next trestle south, 10 feet high; 7 bents, new; timbers, 12 by 12 inches; stringers, iron I-beams packed with cast iron stay strips and bolts, like the west approach of the Muskingum bridge at Zanesville. Next trestle south.

Next three, combined trestle and trussed girders, all nearly new. 3 more trestle girders.

No. 36, a 5-span trestle, at Junction City creek, 4 years old, 14 feet c. to c. No. 36, 5-span trestle.

Nos. 37 to 54, inclusive, small openings mostly 4 years old, some of which will be filled. Nos. 37 to 54.

A tunnel between Nos. 52 and 54, 1,100 feet long. Tunnel.

No. 54, trestle, with spans 15 feet long and 12 feet high. Track, No. 54. curved; stringers made continuous by breaking joints over the caps; a favorable construction for curved trestles.

Remaining structures, 55 to 65, inclusive, all small and not high. Nos. 55 to 65. Two of them have trussed girders, like those in south approach of bridge No. 1.

#### GENERAL REMARKS.

Rails of this division are like those of the Lake Erie division, between Chicago Junction and Sandusky. Though the section of this rail is unfavorable for a secure joint fastening, yet the joints are apparently kept in good condition on this division. Ties and ballast good, but not equal to those on main line of the B. & O. R. R. Remarks.

Structures all appear to be closely watched for defects, and new material substituted or added as decay or weakness appears. The inspection develops no oversight or defects, and the road is regarded as safe.

General remarks applying to all Ohio divisions of the Baltimore & Ohio Railroad, instanced by the inspection tours: Gen'l remarks concerning all the Ohio divisions.

Though the road throughout is found in good condition and safe, yet some portions are kept up to a higher point of excellence than others. This is true of the main line through to Chicago, for that part examined, viz.: Bellaire to Newark, Newark to Chicago Junction, and thence to the State line west. All costly iron structures are on this line, and it has many fine ones. The fact that quite a number of costly iron bridges were found in the process of erection, indicates that the road is still active in the line of improvements. Iron bridges are all of the Pratt and Bollman type, and all have pin bearings. Perhaps one or two exceptions should be made for plate girders. No iron trestles were found. On this line is also found a large quantity of first class masonry. All truss bridges wood and iron, with the exception of No. 9 of the Cen- Iron bridges. Masonry.



Culverts.      tral Ohio division, to be replaced by an arch. No. 1, of Erie division, at Newark, where the speed is always slow, has good abutments. Cut stone arched culverts are also numerous, ranging up to 20 feet in diameter.

Painting.      Useful precautions, aiming at economy are observed throughout all divisions. For instance, iron bridges are painted, and the parts so formed as to admit of painting, to prevent deterioration by rusting. Wooden bridges, as a general rule, are promptly covered for preservation. The setting of clamps and keys of wooden bridge chords in lead paint is a practice of slight cost, but tending greatly to durability of the close joints thus leaded. Wall plates are salted, to prevent the burrowing of ants.

Standards.      Standards are adopted for such materials as can be used in common, and quantities of the materials distributed to material yards along the road. This is true of ties for wooden bridges and trestles, for which standard ties are 6 by 8 inches in section, and 9 feet long where no outside bearers are employed, or with bearers 12 feet long. For iron bridges the same is true of length, but the standard section is stated to be 7 by 8 inches. A standard cattle guard, described and illustrated in fig. 5 of "Economics" in this report, is adopted and specified. Materials for it are on hand at the various yards. Standard wall plate blocks, 12 by 12 inches, are also kept in stock. The Varona Lock Nut is in use and in stock. Timber is sometimes required to be prepared in a certain way. It is preferred that logs be cut through the center, so as to lay open the heart wood, that "sour rot," as it is termed here, may be avoided at the heart wood.

Cattle guard.      Lock Nut.      Preparation of timber.      Steel rails.      All steel rails are 60 pounds per yard, and of one form of section, adopted as standard. The standard section is a good one for holding fish plates, but the sides of the heads do not slope toward the angle of the wheel flanges as much as the average rail section in use, and much less than the so-called Chanute head. Sections sketched from new standard steel rails on cars in transit, give the following measurements, viz.: On a horizontal line across the head, and  $\frac{5}{16}$ -inch from the top the width is 2 inches. At an inch down, the width is  $2\frac{1}{2}$  inches. The "stem" of the rail is  $\frac{1}{2}$ -inch thick, with sides slightly concave. The underside of the head is sloped to about the same angle as the foot or bottom flanges. Width of bottom flanges, 4 inches; extreme depth of rail,  $4\frac{1}{2}$  inches; width of fish plate, at a point  $\frac{5}{8}$ -inch from the rail center,  $2\frac{3}{8}$  inches. Fillets at junction of stem, with head of foot about to a  $\frac{1}{4}$ -inch radius. Foot flanges at edge  $\frac{1}{4}$ -inch thick.

*In procuring iron bridges,*

Mills and factories.      Many are made by the B. & O. Co., but not all. This company has mills and factories of its own, and makes most of the cars and locomotives, including all fittings, trimmings, etc., rolled iron for iron culverts and other and larger structures; in fact everything but rails; but it has not capacity to supply all of its iron bridges.

Iron bridge specifications.      Iron bridges must comply with the following points, viz.: Have  $14\frac{1}{2}$  feet clear width for straight lines, with proper increase for curves.  $18\frac{1}{2}$  feet clear over rails, no cast-iron, except wall plates and skewbacks for end posts; no hollow columns, nor beams, and all posts accessible by the paint brush. Maximum strain for any member, 10,000 pounds per



square inch; as due to passage of a train of consolidated engines of 50 tons each. Adopted type, the Pratt truss.

The weight of heaviest passenger locomotives on this road, on track ready for service, 125,000 pounds. Heaviest freight engine, likewise conditioned, 117,000 pounds. Weight of sleeping coach, 58,000 pounds. Weight of a six-wheeled truck passenger coach, 38,000 pounds. Weight of loaded freight car, 60,000 pounds.

A general rule for the elevation of the outer rail on this road is stated to be 1 inch per degree, up to 3 degrees;  $\frac{1}{2}$ -inch for each additional degree, from 3 to 5 degrees, and  $\frac{3}{4}$ -inch for each additional degree, from 5 to 7 degrees.

The standard switch of this road is the Lorenz's safety switch, and its use is very general, especially where trains run at speed. The cross-rods connecting; the switch rails are here bent downward, so as to lie in a plane below the level of the top surface of the ties. The object of this is, to put those rods out of danger of being caught or struck by dangling brakes, beams, or other parts of trains accidentally out of place. These rods are five in number, and placed about 2 feet apart. These switches are thoroughly made, and accompanied by a heavy cast-iron switch stand. The latter has a base-plate, 15 by 18 inches, from which rises a single trunk in T section, 4 by 5 inches, of 1 inch thickness of flange and web. The height is 32 inches at the top, it branches to form a guide arc slot for the lever to work in. The ends of the arc have notches for receiving a catch on the lever for holding. This catch is held in place by a padlock. The lever is pivoted to the trunk at a point one foot above bottom of base. The switch signal is a revolving one, carried on a vertical rod. The lower end of the latter rests in a socket in the base, and thence it passes up through an eye in a projection from the top of the standard, the same reaching out in the opposite direction from the lever arc. This stand is the essence of simplicity, all the parts being the standard, with lever arc signal supports in one casting, the wrought iron lever, the lever fulcrum pin, and the catch, and the signal shaft. The whole is an admirable design, and evinces much study.

The frog adopted as standard is the Spring Rail Frog, especially as an accompaniment of the Lorenz switch at points passed at speed. At such points the spring rail lies in the position to form continuity of the main line rail, from which position it is pressed or sprung to one side as a train takes the side track. Only one rail is made a spring rail in such cases. The guard rails at these frogs are held by angle brackets, well secured. This frog was adopted by this road two years ago for all main lines of track, but not for side tracks and yards, for the reason that engines might stand over the spring rail and drop water that would freeze the rail fast in winter. This is not likely to occur on main line, as engines are not allowed to stand here long at a time. In winter, men are charged with the duty of looking after these spring rails, to see that they do not get frozen fast. For fifteen years previous to the adoption of the spring frog, the "movable rail" frog was standard. It required the same precautions against sticking by frosts.

The system for supervision of roads is quite thorough. There is a master of roads, and an assistant master for general supervising of all west of the Ohio river. In addition, there is a supervisor of track for each 50 miles of road, and a foreman of track every 5 miles, or for each

section. The section has from 5 to 10 section men. Besides these, there is a general supervisor of bridges over all west of the Ohio river, and an assistant supervisor for each 150 miles. There is a carpenters' gang with its foreman for about each 50 miles. These gangs are shifted about some, as the condition of the work at different points demands.

Departments  
of road man-  
agement.

Computations  
for maximum  
strains.

The road management has three departments, viz.: Transportation, Machinery, and Roads, each with its master.

Computations for the maximum strains of most of the iron bridges reported upon, have been made. The results show that the usually accepted safe maximum of 10,000 pounds for a square inch is but rarely exceeded, and then but slightly. The qualities of iron in the structures can not be given, because tests can not be made on pieces while in existing structures. Details in addition to those given in this report may be obtained by consulting the books of original field notes.

## II. INDIANA, BLOOMINGTON AND WESTERN RAILWAY—"Ohio Division."

Inspected July 11, 12 and 13, and August 1 and 2, 1881.

Gauge.

Gauge of track, 4 feet 8½ inches.

Numbering of  
structures.

Structures are numbered from Sandusky toward Springfield and Columbus.

1. Cincinnati, Sandusky and Cleveland Railroad, Sandusky to Springfield.

No. —, Casta-  
lia river.

No. —. (No. of this not determined. Not shown on structure). Near Sandusky. A through Howe truss, with trusses independently covered. Over Castalia river, a wonderfully clear and beautiful stream. Span, 25 feet; depth of truss, 5 feet 9 inches clear; panels, 8; width, 14 feet. Chord pieces, 5, 6 by 5 inches thick, and without splices. All truss tie rods, two, 1½ inches. Braces, all 6 by 6 inches. Floor beams, about 6 by 14 inches, and about 10 or 12 to the bridge. Stringers, 10 by 10 inches. Ties of 2 inches. Planks, about 6 or 8 inches wide, and 24 of them to the bridge length. No tie lath or guard rail, and the ties are somewhat deranged by creeping. Bridge appears old. The stringers and floor beams are considerably decayed in places, maximum depths of 4 or 5 inches. The addition of several new floor beams to the present ones, and new stringers for strengthening the flooring, ordered to-day by the railway company.

Trestle.  
No. 10, girder  
bridge.

Next, a trestle culvert nearly new.

No. 10, a girder bridge of 23 feet span. Stringers or girder beams, three, 7 by 18 inches. These extend to 6 or 8 feet on the bank. The abutments were originally stone, uncut, and of small size. These walls are now tumbling, and trestle bents are placed near them to carry the bridge's loads, while the walls are left with only the duty of holding the banks up. Ties, 17 to the 23 feet span, sawed to about 6 by 6 inches. Wood guard rails, 6 by 6 inches, notched on ties; bolted every 3 or 4 ties, and spiked on the rest. Mostly 2 or 3 years old, and safe.

Small girder  
bridge.

Next, a small girder bridge of 10 feet span, with tooled stone abutments.

Stringer cul-  
vert over  
ditch.

Next, a stringer culvert over a ditch, with a length of long stringers extending some distance on the banks, and lying on blocks. No ties, except a pair of iron bar tie rods of ½ by 2½ inches section, lying across

from stringer to stringer, to hold the rails from spreading. Rails spiked directly to stringers. Two low trestle bents, with planks outside, at the opening. This arrangement of a comparatively few iron tie or stay bars, apparently an old device, and not to be compared, for safety of track, with the usual number of wooden ties with rails spiked to them.

Next, a good culvert with new ties, 6 by 6 inches, and about 4 or 6 inches between, not stayed with guard rails. Ties somewhat crept out of position.

Another culvert, rather old. Stringers, two, 6 by 14 inches, extending over on banks. The ditch carrying water. Abutments, stone, with a wall plate on each. Other blocks, near ends of stringers on the banks. There appears to be need of some new ties and guard rails here.

No. 21, and another similar one near it. Culverts of about 4 or 5 feet span, between the pair of trestle bents of 12 by 12 inches stuff at the water way. The stringers are each one 12 by 14 inches oak by 24 feet long, reaching over on banks, and resting on bank blocks and trestles. The banks slope down toward the water, between the trestle bents and ends of stringers. Height above water, 4 feet in No. 1, and 10 feet in the other. Ties, 14 to the 24 feet length of stringer, made of split stuff, dressed with the axe. Ribbons, 2 by 6 inches. Trestles slightly settled, and trimmed up with blocks; all good and sound.

Examined two cattle guards near here. Made similar to culverts, and in good condition.

Between this point and Clyde are about 15 small structures, mostly culverts, constructed as those already described, some looking old and others lately renewed. Largest have about 9 feet openings.

Near Clyde is a three bent trestle, 5 years old.

No. 36, a 5 span trestle; first span, 14 feet; next, 20 feet; next, 25 feet; next, 20 feet; and last, 14 feet. Height, 24 feet. Stringers, three, 6 by 20 inches. Bolsters, two, 10 by 12 inches, about 6 feet long. Highest bents have a girt piece bolted on. Longitudinal stays run whole length. Ties, 10 or 11 to 14 feet. Guard rails poor, 4 by 5 inches, 8 inches outside, spiked; safe structure.

No. 38, trestle of 3 spans—one center span 20 feet and two bank half-spans of 11 feet. Height above stream, 15 feet. Stringers, three, 6 by 20 inches, oak. Bents of 10 by 12 or 13 inches. Banks piled about half way up on planking, against the two channel bents, and then slope back to ends of stringers. Ties, 8 to 11 feet, 5 by 6 inches, oak, old. Ribbons, almost nothing. New ribbons and some new ties advisable.

Several culverts, some of them new.

No. 41, a trestle with seven 15-foot spans, 3 years old. Height, 31 feet; total length, 100 feet. Built about like No. 36. The two plumb posts, sill and cap 12 by 12 inches, and batter posts 10 by 12 inches. A girt piece at mid-height, and also longitudinal stays 6 by 8 inches whole length, bolted on. Stringers, three, 6 by 16 inches. Ties, 11 in 15 feet. Ribbons, 6 by 6 inches, notched, and bolted every 4th tie; all good.

No. 45, a deck Howe Truss of 55 feet span; 8 feet, depth of truss; 10 feet between chord. Over Green creek; 10 years old. Covered at once after built with corrugated iron, and renewed with wood; kept well covered. Bored timbers, and found all sound, and a good bridge.

Lower chord, 5, 9, 5 by 10 inches. The 9-inch sticks spliced at third

Another culvert.

No. 21, and another near it, similar to it.

Two cattle guards.

Between here and Clyde, 15 structures.

Trestle near Clyde.

No. 36, trestle.

No. 38, trestle.

Culverts.

No. 41, trestle

No. 45, deck Howe Truss, over Green creek.

panel from each end, and the 5-inch sticks at one panel from middle. Truss ties at end of truss, with iron clamps and keys, two, 1½ inches. Laterals, 6 by 6 inches, and 1½-inch rods top and bottom. Sway braces in 2 sets at the thirds of span, and none at the very ends of truss. Depend partly on the stringers, to keep the trusses from careening. Floor beams, 6 by 12 inches, and 2 to the panel. Abutments, stone. Ties, 6 by 8 inches, oak, 18 inches c. to c. Ribbons, 6 by 6 inches pine, notched and spiked 8 inches out. Stringers, 10 by 12 inches on bridge.

N. approach. North approach, a finely executed cut stone arch in a T wall. Diameter, 15 feet; length of axis. 8 feet. Coping drawn out in three 6-inch courses to 18 inches in all. Cut stone. All on pile foundation, driven into a small lake, from the bottom of which clear water boils up from perpetual springs.

S. approach. South approach a similarly arched T wall, with arch 8 feet drain.

No. 50, trestle. No. 50, a new 12-foot span trestle-stringer bridge, 10 feet high, made one year ago. Bents have two plumb posts, two batter posts, a sill and cap.

Similar structures near. Others, similarly built to No. 50, near here.

No. 51, trestle stringer bidge. No. 51, a 2-span trestle-stringer bridge with spans of 22 and 23 feet, and 20½ feet high. About 6 years old. Over Morrison creek.

Stringers, originally three, 7 by 18 inches, but west span has four. One stringer is nearly new throughout, each side. Trestle bents have 1 plumb and 2 batter posts, a cap, sill, and girt piece at mid-height. Sway braces from the middle point of girt-piece upward and outward to end of cap. The timbers about this bridge considerably decayed; one cap bad. One new cap, one new stringer each side throughout, and half new ties believed required at once for safety.

About 2 miles north of Tiffin is a single span stringer bridge of 16 feet span and 8 feet high. Between this and No. 54 are two new culverts.

No. 54, girder bridge. No. 54, a 2-span girder bridge on good stone abutments and pier. Stone in courses of 16 to 18 inches thickness. Spans, 26 and 25½ feet. Stringer girders, four, 6 by 20 inches each, pine. Ties, 6 by 8 inches oak, 19 in 26 feet. By measurement, given as 16 inches c. to c. Guard rail or ribbon, 6 by 6 inches, notched on the ties and spiked at every tie, placed 8 inches out from rails.

No. 55, through Howe Truss. No. 55, a 2-span through Howe Truss, full covered, 11 years old. Over Sandusky river, at Tiffin. Spans, 107 feet; height of truss, 20.2 feet; width, 16 feet in clear; panels, 10. Abutments and pier of excellent tooled stone masonry, with wing walls at one side, and abutments of the B. & O. R'y bridge close on the other side. Bridge anchored down to the abutments and pier on the wing wall side. Stone masonry laid with cement and iron clamps. Lower chord, 5, 6, 6, 5 by 14 inches. Upper chord, 12 inches deep. Clamps and keys, iron, with a splice at each panel in lower chord. End panel braces, 8 by 9 inches, counters, 7 by 7 inches, and truss ties, two, 1½ inches, and one, 1¾ inches. Floor beams, 7 by 14 inches, pine, 4 per panel. Stringers, 10 by 12 inches, oak. Ties, 6 by 8 inches, 5 to the panel. Ribbons, 4 by 5 inches, notched on and spiked at every tie.

The timbers of the bridge were sounded with a boring bit and found to be sound. Though 11 years old, the fact of its having been covered within one year after erection, appears to have preserved it, by prevent-

ing incipient "dry rot." The wall plates throughout appear to have been overlooked, are weak with decay and crushing down. Need immediate renewal. Otherwise the bridge is in fair condition.

No. 56, a through Howe Truss of 40 feet span, with trusses covered separately. Panels, 8, situated near the west end of No. 55, age 8 years, and covered within 1 year. Lower chords, 5, 9, 5 by 12 inches, without splices. Main braces, 6 by 7 inches. Truss tie rods, two, 1½ inches, all same throughout. Laterals, 6 by 6 inches, and 1½-inch rods. Width of bridge, 13.4 feet. Floor beams, 6 by 14 inches, at 2½ feet c. to c., pine. Stringers, 10 by 12 inches, oak. Ties, 6 by 7 and 8 inches, oak. Ribbons, 4 by 5 inches, notched and spiked at every tie, 10 inches outside of rails. A good bridge.

No. 56, Howe Truss through

No. 57, a girder bridge over a street of Tiffin, with 3 full spans of 15 feet each, and 2 half-spans over sidewalk. Girders, each side, two, 10 by 20 inches. Girders rest on wooden framed trestles, two being in the street, each 10 feet high, having 2 plumb and 2 batter posts, 12 by 12 inches, with braces between plumb posts, and a sill and cap, 12 by 14 inches. Also, two trestles between sidewalk and street, one each side, are each 7 feet high, made of 2 plumb posts, and 2 batter braces, toed or gained into the plumb posts, outside near top, with lower ends on sill. These, with sill and cap, are of 8 by 8-inch timbers. Ties, 5 by 6 inches on edge, at 12 inches c. to c. Old and new ones needed in part. Ribbons, 4 or 5 by 6 inches, notched and bolted at about every 8 feet, and nailed. These ribbons are worthless, but new ones are already ordered by the Railway Co.

No. 57, girder bridge.

Only small structures between Tiffin and Carey.

Carey, junction with the Columbus and Toledo Railway.

From Carey to Findlay is a branch road of the I., B. & W. Ry. Co. of about 16 miles length. Regarded only as tributary to the main line. Two trains per day, each way, are run; speed, 16 miles per hour. Did not go over this branch, but have the following statement concerning it from two officials, viz.:

Small structures between Tiffin and Carey.

There are two through Howe trusses. One is over the Blanchard river; is 4 years old. Span, 121 feet; panels, 12. The other is over Eagle creek. Span, 60 feet; low. Age, 1 year. Also, there is one trussed girder, 3 years old. At Carey is a stringer bridge, 2 or 3 years old, with stone abutments. There is also quite a number of culverts, small and low. Rails iron, with the old chair fastenings.

Two Howe trusses, through.

Carey to Forest, only small openings, some new.

Forest, crossing with P., Ft. W. & C. Ry.

Forest.

South of Forest, No. 108, a stringer bridge of 29 feet 6 inches span with stone masonry abutments. The stringers are 4 large pieces, placed edgewise under each rail, and supported by braces extending from the abutments at angle of 45° up to the underside of stringers, meeting them at the thirds of span. Between tops of braces is a horizontal strut in contact with underside of stringers. This structure is all badly decayed, some points to a depth of 5 inches. The braces appear to be old and weak. Structure in its present condition believed unsafe. New underbraces and strut will probably insure sufficient strength for safety, certainly so if one stringer be replaced by a new one on each side.

No. 108, stringer bridge.



Between above  
and Kenton,  
small struc-  
tures.

Between No. 108 and Kenton, structures are all small, the largest being one 10, and another 20 feet span. Some of them new, and others old. The roadbed along here well elevated above the flat ground on either side.

No. 128, at  
Kenton,  
through Howe  
truss.

No. 128, at Kenton, a through Howe truss, over the Scioto river; uncovered. Age, 4 years. Span, 110 feet; depth of truss, 20 feet; width, 14 feet 3 inches; panels, 10; lower chords, 5, 6, 6, 5 by 14 inches, a splice at each panel; clamps, wood; end panel braces, 8 by 9 inches; tie rods, two,  $1\frac{3}{4}$  inches, and one  $1\frac{1}{2}$  inches; floor beams, 6 by 14 inches, 4 to the panel; laterals, 6 by 6 and 5 inches; and  $1\frac{1}{2}$ -inch rods, top and bottom; stringers, 12 by 12 inches; ribbons, partly 2 by 4-inch oak, nailed, and partly 3 by 4 inches, notched and nailed. Bored at several places into lower chord, and found it sound, though wood was very damp inside at 5 inches depth, more so than the weather would warrant, as though the wood had gained a property of holding water for incipient decay. Ties, 6 by 7 inches, and  $5\frac{1}{2}$  to the panel. The ribbons are badly decayed, split and broken, and nearly of no value to floor. Stringers considerably decayed at north portal, and requiring attention. Abutments of small undressed stone, and with thick joints of soft filling; as if stone were originally laid in common lime mortar. Abutments poor, and likely to make trouble soon by parts falling out. Height, stream to rail, 27 feet. The trusses stand up well, without signs of weakness.

No. 129, string-  
er bridge.

No. 129, a stringer bridge of 2 spans, of about 16 feet each; three stringers, 6, 7 and 7 by 16 inches, under each rail. Stringers partly continuous over middle pier. The abutments and pier of uncut small stone, laid apparently in lime mortar. The joint material between stone failing, and abutments falling. Provisional trestle bents are placed near the failing abutments and pier for security. Stringers extend over nearly 10 feet upon banks, and planted on blocks or sills. Ties are 6 by 8 inches, and 22 inches c. to c. Ribbons, 4 by 6 inches, notched and spiked. Structure believed to be safe.

From above  
to No. 141,  
small struc-  
tures.

Along here to No. 141 are several small openings, some new, one a new 2-span trestle, 30 feet long, and 10 feet high; another a new 10-foot culvert; another a girder bridge of short spans; then two stone arch culverts; then a new girder bridge.

No. 141, girder  
bridge.

No. 141, a girder bridge of about 10 feet span, and 10 feet above bed of stream. Abutments are trestles; the south end fair. North end has two bents, one to aid the other, and both in doubtful condition for perfect safety. Stringers, 6 and 7 by 16 inches, running well over upon the banks. Ties not sawed, and laid at 17 inches c. to c., without tie laths or ribbons.

No. 142, girder  
bridge.

No. 142, girder bridge of 10 feet span, and about 10 feet height above stream. Stringers, one, 6 by 16, and one, 7 by 16 inches pine, under each rail, extend over about 10 feet on banks. The undressed small stone abutment walls falling. Stringer supported on trestle bents, and walls left only to hold the banks up. Ties, 6, in 10 feet.

No. 149, girder  
bridge.

No. 149, a stringer or girder bridge of 2 spans, of 18 and 21 feet. Stringers, three, 7 by 18 inches. Ties, 13 in 21 feet, 6 by 6 inches. Ribbons, 6 by 6, notched and spiked at 8 inches outside. Abutments poor, uncut, small, thin stone with failing joints. Stringers, 10 feet on banks. Structure believed safe.

No. 158, a 2-span trussed girder bridge; old and decayed. Spans, each, 36 feet. A trestle bent has been placed under each at the middle for security. Stringers or chords, oak, four, 7 by 18 inches each, with truss rods from top corners at end to underside of blocks, 10 by 12 inches, edgewise under stringers, are at each third of span. Truss rods are not in service, because their anchorage at ends of stringers is too much decayed and crushed. Structure believed safe at present with the trestles under, but for greater security one new stringer each side is advised. No. 158, two span trussed girder.

No. 166, a small structure, rebuilding. One good stone masonry abutment already in, and the other about half done. Small structures, No. 166.

No. 167, a girder bridge of 20 feet span. Girders, three, 8 by 16 inches each side. Lath, 3 by 5 inches, notched and spiked. No. 167, girder bridge.

No. 168, a girder bridge of 19 feet span. Stringers, three, 7 by 18 inches. Ties, 6 by 8 inches, oak, and 18 inches c. to c. Lath, 2½ by 8 inches, nailed. No. 168, girder.

No. 172, a trussed girder bridge with 30 ft. span girders, like those of No. 176 (which see). Ties, 24 to the span. Ribbons, 6 by 6 inches, notched on ties, and bolted at every third or fourth tie. Good masonry abutments. A good bridge. No. 172, trussed girder.

Junction with C., C., C. & I. Railway.

Junction with C., C., C. & I. Railway. No. 174, girder.

No. 174, a girder bridge of 20 feet span. Girders, pine, 8, 6, 8 by 16 inches each. Ties, 13 to span, 6 by 8 inches. Ribbons, 5 by 6 inches, notched on ties, and spiked with heavy spikes at alternate ties. Wall plates, 12 by 12 inches. Abutments, rubble stone masonry. A fine, new, safe bridge.

No. 176, a trussed girder of 30 feet span; 2 years old. Each girder, three, 7½ by 16 inches, with three truss rods, 1½ inches, each upset for threads. Truss rods go down under two strut blocks at the thirds of span, each 10 inches wide and 12 inches deep. Ties, 17 to bridge, 6½ by 9 inches. Ribbons, 3 by 8 inches, notched, and spiked at each tie. Good stone abutments, and a good bridge. No. 176, trussed girder.

No. 181, a 19 feet span girder with stone wall abutments, so weak as only to hold the banks up. Trestle bents carry the stringers. Bent at south end poor, and apparently not trustworthy. Bridge needs attention. Ties, 6 by 7 inches, 4 inches between, and somewhat deranged in absence of a tie lath. No. 181, girder.

No. 182, a through Howe truss; age, 4 years, over Mad river. Uncovered span, 59 feet; depth of truss, 7 feet 4 inches; panels, 10. Lower chords, 5, 9, 5 by 12 inches. Upper chords, two, 9 by 10 inches. End panel braces, 6 by 8 inches. Counters, 5 by 6 inches. Truss ties, two, 1½ inches. Laterals about as usual; rods, 1 inch. Floor beams, 6 by 14 inches; two to the panel. Stringers, 12 by 12. Ties, 6 by 7 inches, flats at 14 inches c. to c. Tie laths are fence-board, 1 by 6 inches, nailed on ends of ties, and not able to hold the ties in place. Abutments of rubble wall in cement. No. 182, through Howe.

No. 188, a girder bridge of 17 feet span. Stringers or girders, two, 7 by 20 inches, at each rail. Age, 4 years. Ties, 6 by 7 inches, laid 18 inches c. to c., and held by a tie lath. Abutments consist of frame trestles, with two plumb and two batter posts, a sill and cap, all of 9 by 11-inch sticks, with planks on outside to hold banks up. All in fair condition. No. 188, girder, 17 feet span.



No. 189, girder, 19 feet span. No. 189, a girder bridge of 19 feet span, and frail stone abutments. Trestle bent under middle and at the frail abutments. Girders, two pieces under each rail. Ties, 2 feet, c. to c. All believed safe.

No. 190, girder, 2 spans. No. 190, girder bridge; 2 spans of 11 feet each, old, and to be renewed within a year.

Urbana; No. 194, girder, 25 spans, 12 feet each. Urbana; No. 194, a small girder bridge of two spans, each 12 feet. Girders, 10 by 12 inches, oak, one under each rail. Ties, 2 or  $2\frac{1}{2}$  by 6-inch planks, laid close. Between water and girders, 3 feet space. Ties poor, but speed slow.

No. 195, small girder. No. 195, a small girder bridge, with 20 by 20 inches square oak girders. Ties,  $2\frac{1}{2}$  by 3 inches, poor. All ordered by the railway company to be filled.

No. 197, cattle pass. No. 197, James's cattle pass, in excellent condition.

No. 215, through Howe truss. No. 215, a through Howe truss, full covered; 11 years old. Over Buck creek. Span, 120 feet; depth, 20 feet; panels, 12 feet. Lower chords,  $4\frac{1}{2}$ , 6, 6,  $4\frac{1}{2}$  by  $12\frac{1}{2}$  inches. End panel braces, two,  $8\frac{1}{2}$  by 10 inches, and tie rods, two,  $1\frac{3}{4}$  inches, and one,  $1\frac{1}{2}$  inches, not upset. Laterals, 6 by 6 inches, and  $1\frac{1}{2}$ -inch rods below and 1-inch above. Floor beams, 7 by 13 inches; four to the panel. Stringers, 10 by 12 inches, spliced, each at four places on bridge by a 3 feet 8 inches lap and two bolts, oak. Ties, 22 inches, c. to c. Tie lath, 3 by 6 inches, notched on ties, and spiked at every tie. Bridge chords shrunk and open at clamps to  $\frac{1}{8}$  or  $\frac{1}{4}$ -inch, so that one can see through at most places. This has started a number of the locks of the clamp splices to split off. The chord bolts need drawing up, to save the splice locks. But the bridge has not lost its camber. Made four borings at different points of lower chord, and one of them only showed a hollow of rotted wood of  $1\frac{1}{2}$  or 2 inches through vertically. Braces show sap-wood decay. The wall plates are decayed at their outer ends and should be looked after. Abutments are of good sound masonry. Height above water, 23 feet. Bridge covered within two years after built.

## 2. Columbus, Springfield & Cincinnati Railroad, from Springfield to Columbus.

No. 30. No. 30, near London, a small opening.

No. 31, trestle. No. 31, a trestle 90 feet long and 9 feet above water. Spans, 34 feet. No corbels. Stringers, three, 6 by 15 inches at each rail, pine. Ties, 6 by 7 inches, and 20 inches c. to c. Guard rail, 4 by 5 inches, 5 inches outside. Trestles of 2 plumb posts, 12 by 12 inches, 2 batter posts, 8 by 12 inches, and a sill and cap, 12 by 12 inches. Some of them have sunk into the mud 30 inches, with blocks on top of caps. All sound. About  $\frac{1}{2}$ -mile west of London.

About 1 mile east of London are the tottering remains of an old overhead roadway crossing. It is fenced across at each side of track and abandoned. It should be removed, because in great danger of falling upon passing railway trains.

No. 37, thro'g'h Howe. No. 37, a through Howe Truss full covered. Span, 120 feet; panels, 12; depth of truss, 20 feet. Over Deer creek; built in 1872-3; covered about 3 years after built. Lower chord, 5, 6, 6, 5 by  $13\frac{1}{2}$  inches. End panel braces, two,  $9\frac{1}{2}$  by  $9\frac{1}{2}$  inches; tie rods, two,  $1\frac{3}{4}$  inches, and one,  $1\frac{1}{2}$  inches. Laterals at top, 5 by 6 inches, and 1-inch rods. Lower, 6 by 6 inches, and  $1\frac{1}{2}$ -inch rods. Floor beams, 6 by 14 inches, laid 4 to the

panel. Stringers, 10 by 10 inches. Ties, about 6 by 7 inches, but irregular in form, laid 22 inches c. to c. Wood guard rail, 4 by 5 inches, 5 inches out, notched on and spiked at every tie. Good stone abutments. Height above stream about 14 feet.

Made 3 or 4 borings into lower chord, and all showed bad wood inside. From below, the chords are seen to be shrunken, with opened joints at clamps. Locks of clamps splitting off, by not drawing up on chord bolts, as chords have shrunk. It is believed a trestle bent should be placed under this bridge as a support, for security. The stringers near the east portal considerably decayed, and early renewal advised.

No. 46, an arched stone culvert.

No. 46, stone culvert.

No. 48, a deck 2-span Howe Truss, over the Darby creek, full covered. Spans, 140 feet each. Depth of truss over all  $19\frac{1}{2}$  feet, width, 15 feet 6 inches. Panels, 14. Lower chord, 6, 7, 7, 6 by 14 feet. End panel braces, 10 by 11 inches, tie rods, two,  $1\frac{1}{2}$  inches, and one,  $1\frac{1}{4}$  inches. Laterals, top and bottom, 5 by 6 inches, and rods  $1\frac{1}{2}$  inches. Sway braces in 9 sets along the two spans, or about 30 feet apart. Floor beams, 6 by 16 inches, 4 to the panel. Stringers, 10 by 10 inches. Ties over bridge and approaches, 6 by 8 inches, oak, laid 20 inches c. to c. Guard rail, wood, 6 by 6 inches, and 8 inches outside. An inside guard rail of iron railway rail 3 inches from track rail. All guard rails go over bridge and trestle approaches.

No. 48, deck Howe.

The covering of roof is of double boarding breaking joints. Between the rails the covering slopes to middle, with gutter open through. Water falling between rails all flows down, dripping upon floor beams, lateral braces and sway braces. The latter carry water upon lower chord. Floor beams beginning to show decay from this cause. A gutter to collect this water into conductors seems desirable. Abutments are good stone masonry. The bridge seats in masonry are 5 feet broad and 10 feet below lower chord of truss. Bridge is here supported on 3 framed trestles 10 feet high at each abutment and pier.

The west approach is a long heavy embankment to within 80 feet, W. approach. which is a trestle 10 feet high, standing on the stem of the T wall abutment. These trestles are of 2 batter posts, a sill and cap, of 10 by 12-inch timber, with 2 braces crossing inside of 8 by 8 inches, pine. Center to center of trusses, 10 feet. The trestle is to a steeper grade than bridge or embankment. At 100 feet from the bridge the drop in the rail line is 12 inches.

The east approach is like the west, but the rails are in more correct line. E. approach.

The timber in this bridge and approaches is all sound, and the whole structure is in good condition, with the exception of the guttering referred to. The lateral bracing appears rather light for the span. Also the main truss rods are light for train and freight weights as used on some roads at present. A train, for instance, of two locomotives, of 56 feet each in length, and 2,640 lbs. per foot, followed by loaded freight cars of 2,000 lbs. per foot, will cause a strain of 19,000 lbs. per square-inch in the bodies of the end panel main truss rods, and some 22,000 lbs. at the bottoms of the threads, if the rods are not upset. This is about double the strain usually allowed. With a uniform train load of one ton, of 2,000 lbs. per foot, the strain in body of rods would be 16,000 lbs per square-inch.

No. 49, wood  
culvert.

No. 49, a wood culvert in good condition.

An overhead road crossing, supported on trestles of one plumb post, 2 batter posts and cap, all 10 by 12 inches, and sill, 12 by 12 inches. Height, 20 feet. No sway braces.

No. 51, culvert.

No. 51, a culvert with much decayed ties. New ties needed.

Cattle guard.

A cattle guard about 300 feet east of No. 51, badly decayed.

No. 52, culvert.

No. 52, a culvert 6 feet wide and 5 feet deep. Considerably decayed, but not dangerous.

No. 53, culvert.

No. 53, a culvert badly decayed and needing 5 new ties.

Cattle guard.

Cattle guard, about  $\frac{1}{3}$  mile west of Galloway, much decayed.

No. 54.

No. 54, a culvert of 10 feet depth, and 6 feet span. Walls of 12 by 12 inches, timbers piled up, and propped apart to hold banks up. Walls much decayed. Stringers, about two, 6 by 16 inches, rotted through in places. Not safe.

No. 55.

No. 55, a trestle of 7 bents, nearly new and sound. Bents of 12 by 12 inches, sticks, with two plumb posts, two batter posts, a sill and cap, oak; spans, 18 and 20 feet; stringers, two, 7 by 18 inches, under each rail; ties, 6 by 8 inches, oak, 18 inches c. to c.; guard rails, 6 by 6 inches, notched on ties, and 8 inches from rails.

Deck Howe,  
east of Gal-  
loway.

East of Galloway, a deck Howe truss of about 60 feet span, and a trestle at each approach. Called the 7 mile bridge.

Stone culvert.

Next a large stone culvert, arched.

No. 68, girder.

Crossing of Little Miami Railway track, near the Lunatic Asylum.

No. 68, a girder bridge over a road near the asylum. Span, 28 feet; stringers, oak, three, 6 by 18 inches at each rail; ties, 6 by 7 $\frac{1}{2}$ -inch oak, 2 feet c. to c., decayed; guard rails, 3 by 6-inch oak, decayed. Masonry abutments.

No. 70,  
through  
Howe.

No. 70, a through 2-span Howe truss, with continuous trusses. Trusses covered separately. Each span 60 feet, with 11 panels; depth of truss, 7 feet, between chords; width between trusses, 13 $\frac{1}{2}$  feet; lower chords, 5, 10, 5 by 12 inches, with parts spliced with oak clamps and keys. Splice of the 10-inch member at middle of span, the smaller is at two panels away from middle, one each way; braces, 6 by 8 inches; counters, 6 by 6 inches; lateral tie rods, 1 inch; floor beams, 6 by 14 inches, two to the panel; stringers, 12 by 12 inches, spliced with two bolts through; ties, 6 by 7 inches; guard rails, 6 by 6 inches. Abutments stone masonry, with an L-branch to shorten the span, and making a skew bridge. One span over a road, and the other over an abandoned canal. Bridge nearly new and sound. Floor beams are not covered, except at the ends where under the truss covering. The exposed portions are weakened, perhaps a fifth by sap-wood decay. Floor beams deflect about 1 $\frac{1}{2}$  inches as a train passes. Two observations on this.

A curve in track covers part of the west span, the tangent point being about at the west quarter point. Owing to the peculiarity of this tangent point, the continuity of trusses, and convenience of applying apparatus, this bridge was chosen for the subject of the bridge indicator experiments cited at length in the "*Railroad Economics*" article of this report. The actual measurement of the maximum deflections of the bridge at the west mid-span, as determined by the indicator, are for passenger trains, down 0.73 inch, up 0.12 inch, lateral 0.37 inch. At west quarter span point, down 0.5 inch, up 0.08 inch, lateral 0.22 inch.

For freight trains: mid-span, down 0.62 inch, up 0.13 inch, lateral 0.18 inch. West quarter, down, 0.43 inch, up 0.13 inch, lateral 0.18 inch. These figures are actually less than they would appear to be to an observer without instruments.

No. 71, \* a through Howe truss of 3 spans. The two west spans are full covered, while the east span has only a roof. This roof has holes cut through over each set of vertical truss rods. These were cut, and the side covering removed, as new lower chords were recently put into the east span. Spans, east and middle, 140 feet; and panels, 14; west, 100 feet; and panels, 10. Depth of truss, all 20 feet, between chords. Lower chords, 6, 7, 7, 6 by 14 inches; upper, 12 inches deep. End panel braces, two, 11 by 11 inches. Counters, 8 by 8 inches. Truss ties next to end panel, two 1½ inches, and one, 1¾ inches. Floor beams, 6 by 14 inches, at about 30 inches c. to c. Stringers, 12 by 12 inches. Ties, 6 by 7 inches, flat, at 18 inches c. to c. Guard rails, 6 by 6 inches, 10½ inches out. Abutments of stone masonry, about 6 feet thick, and with T-wall branches of 20 feet. Masonry in fair condition.

No. 71.  
through  
Howe.

This bridge, excepting the new lower chords of east span, appears old, and in bad condition. Bored upper chord in three places; at each, after boring about 3 inches, the bit would drop its full length of 8 or 9 inches into hollow decayed spaces. Also sounded the lower chord of middle span at several places with boring bit. At all points penetrated, found timber badly rotted at heart, and chords weakened, by estimate one-third. The west span is decayed less, and being shorter, is in better condition. This bridge needs immediate attention. Trains should be slowed down here, or temporary trestle supports should be put under at both thirds of the middle span, and one of west span. The old lower chord timbers of the east span, lying out, are showing large decayed places, which were inside the chords when in place.

The covering of this bridge is stated to not have been put on till about three years after erection. This appears to have given opportunity for incipient decay, which went on in form of "dry rot" after covering. This view is strengthened by the fact that many bridges much older than this, some nearly double the age, which were promptly covered, are yet in good condition.

No. 72, a through two span Howe truss with one span over the Olen-tangy river, at Columbus. Span, 100 feet; panels, 10; depth of truss, 20½ feet between chords; width, about 14 feet clear. Lower chords, 6, 7, 7, 6 by 14 inches. End panel main braces, two, 9 by 11 inches. Counters, 8 by 8 inches. Truss ties, two, 1½ inches, and one, 1¾ inches. Laterals, ties, 1½ inches, and braces about 6 by 6 inches, with iron angle blocks. Stringers, twelve by twelve inches, spliced, and two bolts; floor beams, six by fourteen inches, four to the panel. Ties, 6 by 7, lying flat, and 18 inches c. to c. Guard rails, 4½ by 5½ inches, placed 10½ inches out from rails. The stringers are raised above the floor beams on blocks; one floor beam to each panel, is bolted to hold it to place; others, and also the stringers are toe-nailed. Abutments of good stone masonry, 10 feet thick, with branch T-wall, 15 feet thick, carrying the track at immediate approaches. Lower chord of bridge continuous, over middle

No. 72, 2 span  
Howe truss.

\* This bridge has been strengthened by pile bents.

pier. Bridge nearly new, and all in good condition. Rails on bridge, 4½ inches extreme depth, and foot, 4 inches wide. Fastenings, the ordinary fish-plates.

## Remarks.

## GENERAL REMARKS.

## Steel rail.

Steel rails are being laid down at numerous places along the whole road. From Springfield east, for several miles in one stretch, we find steel rails. Also from Galloway to the Asylum, steel. On a heavy and long grade from Georgesville east, track is all in excellent condition. Also north of Springfield, steel rails at numerous points. This year 36 miles of steel rail will be laid. Weight of steel rail, 56 pounds per yard. The iron rail is partly with fish-plate fastenings and approved modern section, and partly of the old 20 feet lengths and chair fastenings. On some parts of the road a large number of the fish-plate bolts are worked out of their holes; one, and sometimes two, from a joint.

## Ties.

The ties, on such parts of the road as have steel rails, are sound and good. On some other parts they are much decayed. West of Galloway, ties are very bad. In one case four consecutive ties were found rotted nearly away at the rail bearing. In some of these stretches of weak bearing the rails have gone down into a sag. New ties should be interspersed among the old. As far as observed the rails are full spiked in ties.

## Ballast.

Ballast is gravel; and, as far as dust is concerned, good. The roadway as a whole, taking the line through, appears as if the work of section was light; and that reports from section masters and road and bridge inspectors, either few, insufficient or disregarded. The fact that repairs and renewals are going on at numerous points where the work is left in first-class order, indicates that if ample inspection and means were allowed, the road would soon come to be one of the finest in the State. It is much to the credit of this line, formerly the C., S. & C., that no serious accident has ever occurred upon it.

III. BELLAIRE AND SOUTHWESTERN RAILWAY, from Bellaire to Woodsfield; inspected July 29, 1881.

Gauge of track, 3 feet 6 inches. Structures numbered from Bellaire.

## No. 1, Pratt Truss combination.

No. 1, a through combination Pratt Truss, double intersection of 125 feet span of 10 panels. Depth of truss, 22 feet. Over McMahon's creek, at Bellaire. Built in 1878, by Hubbard & Eddy, of Cleveland, O. Stated rolling load, 2,000 lbs. per foot, and factor of safety 4. Width between trusses, 12 feet clear.

End posts of truss, four, 5½ by 10 inches, wood. 1st column in truss, two, 5 by 10 inches. 1st main truss tie at end, two, 1½ inches, round. Next two, 1½ inches, round. Both of these sets start from top of the inclined end post, one reaching over one panel and the other over two. Lower chord at the middle panel, two, ¾ by 3 inches, and two, ¾ by 3 inches. Top chord, wood, of same sizes as the end posts. Top laterals, 6 by 6 inches, and 1-inch rods. Bottom lateral ties, 1 inch rods. Floor beams suspended by 2 inverted U 1½-inch rods. Floor beams, two, 8 by 14 inches. Stringers, two, 6 by 12 inches.

Abutments consist each of 2 trestle bents of four 10 by 12-inch posts, and two 8 by 12-inch batter posts, and braced with two, 2 by 12-inch sway braces. The two bents of each abutment are about 6 feet apart,

and framed together by three 12 by 12-inch cross caps at the seat of each bridge end post, and by 8 by 8-inch sticks put in as bracing. Each framed abutment stands on 12 piles well driven.

The east approach a pile trestle 4 years old. Piles, oak, 4 to the bent; caps, 12 by 12 inches; sway braces, 2 by 10 inches; span, 15 feet. Bank at east end held by planks against end pile bent. Stringers, two, 6 by 12 inches, oak. Ties, 10 to each span, notched on to stringers. No guard rails.

The west approach about 20 spans, of 15 feet each, of framed trestle. —See No. 2. On this approach, about  $\frac{3}{4}$  its length, are wheel guards or stay-laths,  $2\frac{1}{2}$  by 8 inches, not notched, but with a spike through into each tie. On the portion with no stay-lath the ties are badly swung around, and irregularly out of place. One tie swung under stay-lath. 12 ties to the span. Ties, 6 by 7 inches, over all parts of No. 1, all in good condition. Sap-wood partly decayed.

About 40 feet east of east approach is a single bent trestle opening over a street drain, not quite in as good condition as No. 1.

No. 2, a trestle of 5 bents, each bent consisting of one vertical post in the middle, and one batter post each side, about 3 feet from the middle post, and all stayed with two crossing sway braces (see No. 4). The stay lath is here spiked to every tie. Near the east end is a bad quirk in track, due to a washout.

No. 3, a 5-bent trestle, like No. 2, with stay laths notched on. Over Sunfish creek.

No. 4, a 23-bent trestle, over Pinch run; length, 500 feet. Each bent is framed of a heavy sill; a 10 by 13-inch cap; a central plumb post, 12 by 12 inches; and one batter post, 6 by 12 inches, each side. Tenons on plumb and batter posts, 3 inches, top and bottom, with a wooden pin put through, but without "gains". Sway braced. Sill anchored down by piles of stone. Stringers, oak, anchored on with iron clamps. This anchorage is to prevent parts from floating off in high water. Stay laths, 4 by 6 inches, notched and spiked at alternate ties. Ties, 4 by 6 inches, notched on stringers. Stringers, 12 by 15 inches.

Near west end of No. 4, is a queen post truss, braced. Length, 33 feet. Lower chords, two, 4 by 8 inches, each part one stick. End inclines 10 by 10 inches. Vertical tie rods, two,  $1\frac{1}{2}$  inches. Braces in middle rectangle, one, 4 by 8 inches. Depth, 4 feet. Laterals,  $\frac{3}{4}$ -inch rods. Braces notched about  $\frac{3}{4}$  inch into lower chord. Floor beams, two, 7 by 14 inches. Supports far above queen-post. Single framed trestles on 5 piles, framed of 3 plumb posts, 4 batter posts, a sill and cap; and with sway braces. Height above ground at west end, 25 feet.

West of this queen-post system is framed trestling, standing on piles, reaching a considerable length above ground. Trestles consist each of 2 plumb posts, 2 batter posts, sills and cap, and sway braces crossing. 4 piles.

Some distance west is a small opening, not numbered, over a tram way from a coal mine.

No. 5, a queen-post system, 33 feet long. Lower chords, two, 5 by 10-inch sticks, each in one piece of full length. Top chord, one, 9 by 12 inches. Braces in middle panel, 4 by 12 inches. Vertical tie rods, two,  $1\frac{1}{2}$  inches. Depth of truss about 4 feet. Floor beams, two, 8 by 14



inches. End bearings same as for queen-post in No. 4. Ties, 6 by 7 inches. Tie lath, 4 by 6 inches, on edge, notched and spiked every 2 or 3 ties. Stringers, 6 by 12-inch oak. End walls below are planks against the supporting trestle bents to hold the earth embankment at opening.

No. 6, combination Pratt truss.

No. 6, a combination Pratt truss of 63 feet length, and 7 panels. Inclined end posts, two, 6 by 10 inches, and one 8 by 10 inches. Lower chords at middle, two,  $3\frac{1}{2}$  by 1 inches. End main truss ties, two,  $1\frac{1}{2}$  inches, square. Laterals,  $\frac{3}{8}$ -inch rods. Floor beams, two, 6 by 14 inches, suspended by two inverted U-rods of  $\frac{3}{8}$ -inch iron. Stringers, two, 5 by 12-inch pine (all stringers before No. 6, oak). Lateral and U-rods not upset for threads. Gentle curve at west end.

West approach trestling with bents, framed of 2 plumb, and 2 batter posts, 10 by 12 inches; a cap, 10 by 12 inches, and a sill. Spans, 15 feet. Ties, 10 to the span. Stringers on this trestle, oak, probably same size as on bridge. No tie lath to No. 6.

No. 7, combination Pratt truss.

No. 7, a combination Pratt truss of 63 feet length. End posts, two,  $5\frac{1}{2}$  by 8 inches, and one 8 by 8 inches. Lower chord at middle, two, 1 by  $3\frac{1}{2}$  inches. End main truss ties, two,  $1\frac{1}{2}$  inches. Pin connections with  $2\frac{1}{2}$ -inch pins. Top chord same as the end post. Lateral ties,  $\frac{3}{8}$ -inch rods. Floor beams, two, 6 by 14-inch, pine. Stringers, pine, two, 6 by 12 inches. Ties, 6 by 7 inches, on edge 15 inches apart. Curve on bridge with elevation of outer rail of  $3\frac{1}{2}$  inches. Degree of curve,  $27^{\circ} 35'$ . Good stone masonry abutments. Sway braces for keeping trusses erect, from floor beams overreaching 4 feet, and a brace from end to top of truss. One cast angle block at end broken, and replaced by a wrought iron strap without angle.

No. 8, combination Pratt.

No. 8, a combination Pratt truss of 6 panels. End posts, two, 4 by 9-inch pieces, wood. Lower chord at middle, two,  $\frac{3}{8}$  by  $2\frac{1}{2}$  inches. Main truss ties at end of truss, two,  $1\frac{1}{2}$  by  $1\frac{1}{2}$  inches. Lateral ties,  $\frac{3}{8}$  inch; track straight. Bridge anchored down to abutments by rods.

Nos. 9 and 10.

Nos. 9 and 10, same length and kind as No. 8. No. 9 has curve in track. No. 10 is anchored down to abutments.

No. 11.

No. 11, same as No. 7, except track has no curve.

No. 12.

No. 12, same as No. 5, for both the queen-post and supports.

No. 13, queen-post truss.

No. 13, a queen-post truss, 40 feet long. Lower chords, two, 6 by 12 inches. Top, one, 10 by 12 inches. Braces at middle panel, one, 4 by 12 inches, notched to lower chord, cutting latter to 9 inches depth. End locks cut to  $8\frac{1}{2}$  inches depth. Vertical tie rods, two,  $1\frac{1}{2}$  inches round. Depth of truss about 6 feet. Lateral ties, 1 inch. Floor beams, two, 8 by 14-inch oak. Stringers, 6 by 12-inch oak. No tie laths. Ties about as others, 6 by 7 inches. A gentle curve on bridge.

No. 14.

No. 14, a 40 feet truss, in three panels of 13 feet, differing from the queen-post truss in the middle panel by having braces in this panel from the ends at lower chord to middle of top chord, and at this junction of braces a vertical tie of two  $1\frac{1}{2}$ -inch rods. Ties at end of this panel, two,  $1\frac{1}{2}$ -inch rods. Lower chords; one 5 by 12 inches, and one 4 by 12 inches. Top, one, 10 by 12 inches, all oak. Floor beams, two, 8 by 14 inches. Stringers, 6 by 12 inches. Ties, 6 by 7 inches, and no stay lath.

No. 15.

No. 15, same as No. 14, except here the span is 33 feet; all oak.

No. 16.

No. 16, a peculiar truss in 4 panels of 14 feet each. Span, 56 feet. Lower chord in two pieces, 7 by 12 inches each, with one spliced at



about a third of span, and the other at two-thirds; the sticks breaking joints over the splices. Braces all incline toward the center, and no counter braces. Three sets of vertical tie rods. Middle ones, two,  $1\frac{1}{4}$  inches round. Next two,  $1\frac{3}{8}$  inches. Depth of truss, 7 feet. Ties, 6 by 7 inches, edge. All oak, except lower chord.

In bad condition; joints of lower chord opening, by clamps tearing off the hooks from the chord pieces. Joints now 1 inch open. It is stated that a stick of timber will be spliced on outside of chords, spanning over the failing joints and making it safe.

No. 17, a queen-port truss of 30 feet span. All oak, and good. Middle panel braced. West approach a trestling of about 3 spans; all oak. Ties as in last, or 6 by 7 inches, with no tie lath. No. 17, queen-post.

Between this and No. 18 is a slip side, filled with a trestling. This will be filled again with earth before winter. At another point near here a bank has slipped and been filled again with earth. Slip side.

No. 18, a high trestle, 51 feet high at highest point; 22 bents, 15 feet span. It required 72 M feet of lumber to build it. Ten bents are two-story, there being in them a "story beam." Trestles all end at top with two plumb posts, 10 by 12 inches, and two batter posts, 8 by 12 inches. Cap, 10 by 12. Below the story beam the main timbers are 12 by 12 inches. Braces not put on regular, but plenty of them. Above the story beam, braces are 2 by 10 inches, and below  $2\frac{1}{2}$  by 12 inches. The bracing is divided into panels, by 4 by 12-inch panel planks, notched on the upright timbers. At the highest part of trestle longitudinal sticks, 22 in number, 4 by 12 inches in size, and notched on truss from bent to bent, all oak; 3 years old. Stringers, two, 6 by 12. Under each rail ties, 12 to bent, 6 by 6 inches and 7 feet long, notched on stringers. Tie laths, two, 2 by 6 inches each side, 14 inches outside. An iron guard rail on lower side, but none upper, except  $\frac{1}{2}$  the length at east end. Trestle on a 14 degree curve, which curve is believed to be ill-advised. No. 18, trestle.

No. 19, a trestle on 14 degree curve, being filled and soon will be entirely filled up with earth. Iron guard rails and tie laths like No. 18. No. 19, trestle.

No. 20, a 16-bent trestle, partly straight, and partly with a curve of less degree than that of No. 18. Iron guard rail on lower side, and a tie lath of wood. No. 20, 16-bent trestle.

No. 21, a trestle 30 feet high at one point. All of one-story. Sills all buried. Built similarly to No. 18. Bents connected longitudinally by 6 and sometimes 8, pieces of 4 by 8 stuff. Spans, 15 feet. Trestle contains 82 M feet board measure of lumber; all oak. Stringers, two, 6 by 12 inches, and 30 feet long. Tie lath, 2 by 6 inches. Guard rail of iron on lower side, the trestle being on a reversed curve; as the curve reverses the guard rail is passed to the other side. Ties, 12 to the bent, sawed. West end of structure rather temporary, being of oak log stringers and common wood ties. One or two hundred feet of west end will be filled soon. No. 21, trestle.

No. 22, a curved trestle of 13 bents; curve not so sharp as in some other trestles. One span over a road is 18 feet, but has 3 stringers, each 7 by 12 inches; other stringers, two, 6 by 12. Tangent point on trestle. No. 22, trestle.

No. 23, a 23-bent trestle on a curve, at west end, log stringers of 30 feet each. This portion to be filled this season, including at least 50 feet of west end. Spans, 15 feet. Under each rail the stringers are two, 6 No. 23, trestle.

by 12 inches. No inside guard rail of iron. Tie laths, 2 by 6 inches. Ties, 6 by 6 inches, 7 feet long; 12 to the trestle bent.

No. 24, trestle.

No. 24, a trestle, built like others. A reversed curve on it. Height of trestle, 52 feet at one point. Spans, 15 feet; 74 M feet of lumber in this trestle. Trestle bents more regular in framing than others before it. Stringers, two, 6 by 12, under each rail. No guard rails of iron. Tie laths, 4 by 6 inches, notched on the ties. The curve near the east end on trestle, by measured chord and versed sine, is determined to be of  $20^{\circ} 44'$ . Radius, 278 feet. Curve appears irregular. A portion of trestle at extreme east end with stringers of logs hewed to 12 by 12 inches.

No. 25, trestle.

No. 25, a trestle 40 feet high, with a comparatively moderate curve. No iron guard rail. Tie laths notched on.

No. 26, trestle.

No. 26, an 8-bent trestle, 30 feet high. A curve in track on east end. Tie laths notched on ties. No iron guard rail.

No. 27, trestle.

No. 27, a 11-bent trestle with straight track. Built about as the others, except the one 18-foot span, where there are three, 6 by 12 inches stringer pieces at each rail. Flooring about as others. No iron guard rail.

No. 28, trestle.

No. 28, a trestle about like others, with a curve for 60 feet on east end, with iron guard rail. The channel span a deck Howe Truss of about 40 or 50 feet span, supported on heavy 2-story trestling. Lower chords, two, 6 by 12 inches, spliced. Panels, 4. 1st main truss tie, one,  $1\frac{1}{2}$ , and one,  $1\frac{1}{8}$ -inch rods. End brace, one, 8 by 13 inches. Splice of lower chords made with wood clamps, holding well. No lateral braces. Sway braces in 4 sets, 6 by 6 inches, with  $\frac{3}{8}$ -inch rods straight through. All oak. Height, 52 feet. Lumber in structure 76 M. feet board measure. Over Rocky Fork.

No. 29, trestle.

No. 29, a straight trestle built about like others. Tie lath notched on the ties.

No. 30, trestle.

No. 30, a trestle on about a 12 or 14 degree curve, like others in build.

No. 31, trestle.

No. 31, a curve trestle of 7 bents, built like others.

No. 32, through Howe Truss.

No. 32, a through Howe Truss of 48 feet length, with end panels cut away to the end braces. Lower chord,  $4\frac{1}{2}$ ,  $8\frac{1}{2}$ ,  $4\frac{1}{2}$  by 12 inches, with four splices, holding fairly. Angle blocks of wood holding well. Main end truss ties, two,  $1\frac{1}{8}$ -inch rods. End braces, or inclined end posts, two, 8 by 9 inches. Truss supported on 2 trestles at each end, framed together, 8 feet above water; all oak. Floor beams, twelve, 7 by 14 inches; ties, 6 by 6 inches, and 10 to the panel; stringers, 6 by  $10\frac{1}{2}$  inches.

Slip side.

Between No. 32 and No. 33, a slip side with a low trestle put in.

No. 33, trestle and Howe Truss.

No. 33, east portion a trestle on a curve, with 8 bents. Then, a Howe Truss, regular, of 50 feet span and 6 panels. Lower chord of truss,  $4\frac{1}{2}$ , 7,  $4\frac{1}{2}$  by 12 inches, spliced in each panel. Clamp necks, 2 by 12 inches, oak. End brace, two, 6 by  $6\frac{1}{2}$  inches. Main truss rod at end, two,  $1\frac{1}{8}$  inches. The straps against which the main truss rods bind on outsides of chords, are too light,  $\frac{3}{8}$  by  $3\frac{1}{2}$  inches, and yield by the pressure. Depth of truss,  $6\frac{1}{2}$  feet clear. Angle blocks, wood, and shrunk. Some joints of lower chord opening slightly, but locks not splitting off. Upper chord considerably crooked, but why is not easily seen; apparently due to seasoning of the timber. Will put a trestle bent under middle. Trusses appear rather weak. Floor beams, 5 by 12 inches, and

3 to the panel. Laterals, 6 by 6 inches, and  $\frac{3}{4}$ -inch rods. Tie laths, 4 by 8 inches, notched; not covered.

No. 34, a trestle of 3 bents on a curve. Height, 10 feet.

No. 34, trestle.

No. 35, a Howe Truss, exactly like No. 33 in construction and dimensions. Not so badly out of shape by springing of timber. A chord piece loose. Will have a trestle bent put under.

No. 35, Howe Truss.

No. 36, a small trestle of 4 bents, like others. Bents with 2 plumb posts, 2 bolster posts, etc.

No. 36, trestle.

No. 37, a through Howe, 2 years old. Span,  $141\frac{3}{4}$  feet; depth of truss, 21 feet c. to c.; panels, 12. Lower chords, 5, 6, 6, 5 by 12 inches. Upper same, except 10 inches deep. A splice in lower chord at each panel. Clamps and keys, oak, and painted in with red lead. End main brace, two, 9 by 9 inches. First main truss tie, three, 2-inch rods. Angle blocks iron, and all sound. Floor beams, 7 by 12 inches, 4 to the panel. Laterals, 6 by 6 inches, and  $1\frac{1}{4}$ -inch rods. Stringers, 10 by 10 inches, oak. Ties, 6 by 7 inches, with 4 by 6-inch tie laths, notched on. The so-called tie lath is on some roads called the wheel guard. Over Captina creek. A good truss.

No. 37, thro'gh Howe.

West approach a 5-bent trestle.

No. 38, a 2-bent trestle like others.

No. 38, trestle.

No. 39, a small through Howe Truss, uncovered, all oak. Depth of truss, 7 feet. 8 panels. Lower chords,  $4\frac{1}{2}$ , 7,  $4\frac{1}{2}$  by 12 inches. End main brace, two, 6 by  $6\frac{1}{2}$  inches. 1st main truss tie, two,  $1\frac{3}{8}$  inches. Laterals, 6 by 7 inches, and  $1\frac{1}{8}$ -inch rods. Stringers, 6 by 10 inches, flat. A good bridge.

No. 39, thro'gh Howe Truss.

No. 40, a small through Howe Truss, exactly like No. 39.

No. 40, thro'gh Howe Truss.

No. 41, also like Nos. 39 and 40, the three having good stone abutments, and all in good order.

No. 41.

No. 42, a small trestle.

No. 42.

No. 43, an 18-bent trestle with curve over part of it. Channel span a queen-post truss of 28 feet span. Lower chords cut a third off at panel points. Lower chord, 1 piece, 5 by 10 inches. Depth of truss about 8 feet. Vertical tie rods,  $1\frac{3}{8}$  inches round. This truss rests on trestling.

No. 43, trestle.

Nos. 44 and 45, straight, small, low trestles, built like others.

Nos. 44 and 45.

No. 46, a 19-bent trestle. Greatest height, 30 feet. A tangent point in track curve at east end. At Taylor's.

No. 46, trestle.

No. 47, a 24-bent trestle, 21 feet high, with straight track.

No. 47, trestle.

No. 48, a 3-bent trestle like others, and in good condition.

No. 48, trestle.

No. 49, a 16-bent trestle, 25 feet high, all oak. Spans, 14 feet. Bents consist of 2 plumb posts, 2 batter posts, all 12 by 12 inches, and bracing. Ties rather far apart. Tie laths, 4 by 6 inches, notched on. Built on a curve. At the west end the curve is  $18\frac{1}{2}$  degrees, at middle  $13\frac{1}{2}$  degrees, and at the east end it is  $15\frac{1}{2}$  degrees. Over Wisener creek.

No. 49, trestle.

No. 50, a 3-bent trestle over Starr creek.

No. 50, trestle.

Next, a large structure with no number, over Sun Fish creek. East end a 10-bent trestle 28 feet high, with 20 feet spans. Stringers, two, 6 by 12 inches, oak, with 12 by 13-inch holsters, 8 feet long, notched on caps, and with a 1-inch bolt near each end. Plumb posts, 12 by 12 inches; batter posts, 10 by 12 inches; sway braces, 3 by 10 inches; longitudinal pieces, two, 5 by 8 inches, from bent to bent. Sills rest on walls of masonry.

Structure over Sun Fish cr'k.

The channel span is a 90 feet span, deck Howe Truss, of 19 feet depth c. to c. of chords. Panels, 10. End tie rods of truss, two,  $2\frac{1}{2}$  inches. Main braces at end of truss, 8 by 9 inches. Counters, 6 by 6 inches. Lower chord,  $6\frac{1}{2}$ , 8,  $6\frac{1}{2}$  by 12 inches, spliced at alternate panels. Angle blocks, iron. Clamps and keys laid in red lead. Laterals, 6 by 6 inches, and 1-inch rods. Sway braces in 4 pairs, 6 by 6 inches. Floor beams 4 per panel, 6 by 12 inches. Stringers, two, 6 by 12 inches. Stone abutments.

The west approach like east, except there are no stone walls for trestle seats. Stay laths, 5 by 5 inches, over all. A tangent point to curve in track on the east approach, but the truss and west approach straight.

No. 51, trestle. No. 51, a 4-bent trestle, on a curve, 15 feet high, and built like others.

No. 52, trestle. No. 52, a 3-bent curved trestle.

Tunnel. Next a tunnel of 150 to 200 feet length, cut to a 10 or 12° curve, through clay, sandstone and soapstone. Openings, 12 by 15 feet; lined with 12 by 12-inch timbers, placed 4 feet, c. to c., and with 3 inches plank laid outside.

No. 53, trestle. No. 53, a 2-bent trestle, on a curve.

No. 54, trestle. No. 54, a straight 2-bent trestle.

Nos. 55, 56 and 57, trestles. Nos. 55, 56 and 57, 2-bent trestles, with curves on first and last. Ties, 6 by 6 inches, at 14 to 16 inches apart.

No. 58, trestle. No. 58, a 3-bent trestle with 20 feet spans, with bolsters. Straight track. All spans over 15 feet in trestles have bolsters under stringers.

No. 59. No. 59, a 2-bent straight trestle.

No. 60. No. 60, a 6-bent trestle, with 20 feet spans and bolsters.

No. 61, trestle. No. 61, a 2-bent straight trestle, 10 feet high.

Woodsfield. Woodsfield Station.

#### Remarks.

#### GENERAL REMARKS.

Maximum speed of train. The maximum speed of trains is 20 miles per hour. The trains are four per day, two each way, one mixed and one passenger.

Telegraph. There is no telegraph line along the road, so that trains are run by time schedules, and not at all by wire. The engine runner of our train said the curves are rather too sharp for his 6-wheel connected engine. Curves. Weight of this 6-driver engine, 21 tons. Steam pressure, 120 pounds per square inch. The engines are stated to be moguls.

Ballast. Ballast mostly of excellent materials, about half of it is broken stone. In many places the quantity of ballast is meager, it being crowned or convex, and at the highest point at mid-gauge it sometimes rises but little over the mid-height of ties. But the ballast appears to hold the track, though the latter is badly out of correct line in many places. It appears, however, not to be so much the fault of ballast as of the embankments, which, at some half dozen places, make trouble by slipping. Also, the road is being improved in grade and alignment at several places at which the track was found badly out temporarily. Some of the trestles with the sharpest curves appear to be distorted by the action of the forces due to curvature. At one trestle the curve appeared unduly sharp at one point, and with signs of drawing apart of timbers, occasioned by the outward thrust of centrifugal force. Trestles

Embankments.

with such sharp curves, it is believed, should be inclined in some measure, according to rail elevation; though in all cases the bents here appear vertical.

The rails measure 30 feet in length, for a common length. Ties are usually 15 to the rail length, though occasionally 14 only. The rails are mostly 35 pounds per yard, though 40 pounds are now put in when any new ones are added. Four miles of the 40-pound rail are now down at points of heavy grade. Rails are iron and full spiked. Rails.

The stated number of ties per mile is 2640. White oak, 6 feet long, some of them from Virginia. Ties.

The maximum grades are 130 feet per mile, the road running through very hilly country. At points the line appears to rise to the heights of elevated ground, beautiful distant views and fine scenery being presented. The road appears to be mostly serviceable to the farming interests along the region. The country appears like an old and long settled one. The wealthy farmers along the line contributed largely to the building of the road. Grades.

Construction on this road commenced about 4 years ago, but the line has not been operated through but about 1 year.

The stated maximum curvature of curves is 14 degrees, but the actual curvature of many curves is greatly in excess of this figure, as shown by the several results given in connection with trestles (see Nos. 7, 24 and 49). It is believed that some irregularities of curvature of line on road bed are due to lateral creeping of track, occasioned by workmen while tamping and adjusting. Curvature of curves.

The cattle guards are of good and complete design. The pit is about 2 feet deep. Two 12 by 12-inch sills are placed crosswise the track-line. On these is placed a frame, consisting of two 12 by 12-inch sticks, beveled at top corners, upon which the rails lie; the same having their ends let into 4 by 12-inch planks about 1 inch and spiked. The 4 by 12-inch sticks are about 10 feet long, and when in position, rest on the two sills above-named. Also the ends of the 12 by 12-inch beveled sticks rest on the sills. The rails are spiked to these beveled sticks. To the ends of the 4 by 12-inch crossing sticks are spiked pieces about 2 by 4 inches, reaching up about 5 feet, but reclining outward. Fence boards are nailed on the latter, giving thus a reclining fence length (or part length), crossing the ends of the pit. Cattle guards.

Where found necessary, a frame of slats is laid in the space between the rails, and also each side of them. The latter frames are made by nailing 4 slats of about 2 by 4 inches, sharpened on one edge, to short bits of plank 1½ by 6 inches, and about 2 feet length, and so nailed that the sharpened edges are upward. The frame between the rails has 5 slats. The 1½ by 6-inch plank pieces are placed so near the ends of the slats, that they lie very near the 4 by 12-inch sticks when in position, and thus the slat racks do not slide out of place. To examine or repair a guard, the slat racks are easily lifted.

This guard appears to be a very simple, inexpensive and good one. In some cases the timbers are lighter, say 10 by 12 inches, and the slat-racks may in some cases be left out.

This road appears to be in very good running condition. The structures being nearly new, are sound and strong. Many of the structures General condition.

are heavier in proportion for the narrow gauge rolling stock, than found on many full gauge tracks. For instance, trestle timbers are in some cases 12 by 12 inches, for posts which are usually of that size under full gauge track.

**Bridge covering.** One fact to be regretted as a future consideration, is the absence of covering for bridges, on account of which comparatively early renewals will be necessitated.

IV. WABASH, ST. LOUIS AND PACIFIC RAILWAY, from Toledo westward via Defiance to State line. Inspection made in July, 1881.

Structures are numbered from Toledo westward. Gauge of track, 4 feet 8½ inches.

**Plate girder.** No. 5½, an iron plate girder with good stone abutments. Made for a double track.

**Combination post truss.** No. 6, a combination post truss. Span, 153 feet; width, 14 feet in clear. Main truss tie from top of vertical end post to end of the first panel, a half panel in lower chord, two, ⅝ by 3½. From top of same end post to end of the 1½-panel distance, two, 1½ by 4. The timbers recently bored by the chief engineer, and found sound. The bridge is discredited by the railway company, and is to be replaced by a new one, which is already ordered and will be up before snow falls.

**No. 26, pile bridge.** No. 26, a pile bridge 64 feet long, with 4 pile bents, and spans of 12½ feet. Has been completely rebuilt within a year.

**No. 55, pile bridge.** No. 55, a pile bridge 65 feet long, in place of a former stone arch. One or two years old.

**No. 62, pile bridge.** No. 62, a pile bridge; 1 year old. Length, 212 feet. Four oak piles at each bent. Bents 10 feet apart. Caps, two, 12 by 12 inches; one placed on the other. Height, about 12 feet above bed of stream. Stringers, two, 6 by 15 inches. Bearers, one, 6 by 15 inches. Ties, 6 by 8 inches, 14 feet long, and 16 inches c. to c. Wheel guard, wood, 10 inches outside of rail, and still outside of first 28 inches a second wooden guard, both sets 4 by 8 inches, notched, and bolted every 4 or 5 feet.

**No. 64, pile bridge.** No. 64, a pile bridge, similar to 62. 408 feet long, with 37 bents.

**No. 65, pile bridge.** No. 65, a pile bridge 304 feet long, with 28 bents. This has an iron guard rail inside, in addition to the above-named two wooden wheel guards.

**No. 79, pile bridge.** No. 79, a pile bridge over Gilsons' creek, 2 years old. 498 feet long.

**No. 83, pile bridge.** No. 83, a pile bridge 127 feet long, about two years old, and built similarly to the others above.

**No. 100, Pratt truss.** No. 100, an iron through, double intersection Pratt truss of 4 spans of 151½ feet each, by the Detroit Bridge Company, in 1871. Over Maumee river, at Defiance, Ohio. Depth of truss, 22½ feet. Panels, 11. Each panel 13 feet 4 inches long. Abutments and piers skewed with end panels of bridge, 11 and 14 feet. End posts, 12 by 18 inches, of two channel bars with a system of double slats on each side; slats cross at their middles with one rivet through two at ends and the channel flanges. Channel bars, 12 by 3 inches, and 1⅞ inches web. Slats, 2 by 7⅞ inches, crossing at about right angles; 68 in number, altogether. First truss columns, 6 by 9½ inches, open, and of 2 channels, 6 by 1⅞ inches, bound with latticing, not crossed. Pins, 3 inches. First main truss tie, two, 1⅞ inches square. Next two, 2 by 2 inches. Both of these



sets start from top of inclined end post. Next ties, two,  $1\frac{1}{2}$  by  $1\frac{1}{2}$  inches. Lower chords at middle, four,  $2\frac{1}{4}$  by  $2\frac{1}{4}$  inches. Ends, two,  $1\frac{3}{4}$  by  $1\frac{3}{4}$ . Floor beams, two,  $4\frac{1}{2}$  by 12 inches. I-beams with  $\frac{9}{16}$  inch web, suspended from truss pins by 2 inverted U-hangers of  $1\frac{1}{4}$  inches square iron. Lateral ties,  $1\frac{5}{8}$ -inch rods at end. Stringers, two, 6 by 16 inches oak. Ties, 6 by 8 inches, with 8 inches between by 13 feet length. Guard rail, 8 inches inside of rails. Wheel guard, 18 inches outside, and bolted every 4 or 5 ties. Bearers, one, 6 by 16 inches, and a second wheel guard notched on all ties, and bolted every 4 or 5 ties.

South approach a small iron through Pratt truss of 66 feet span. End posts, 9 by 18 inches, like large ones in construction. Panels, 7. Depth, 8 feet. Panels, 9. Width, 14 feet clear. End main truss tie, two,  $1\frac{3}{8}$  by  $1\frac{3}{8}$  inches. Lower chords at middle, three, 2 by 2 inches. Flooring like that on the principal structure. All on good masonry abutments and piers.

This is an excellent structure of fine workmanship. It is acknowledged to be rather light for present traffic. Trains pass at nearly full speed.

No. 101, a combination through Pratt truss, about 2 years old, with the upper chords and end posts well covered with tin. Over Third street, Defiance. Panels, 7. Depth, 8 feet  $\frac{1}{2}$  inch, c. to c. Lower chords at middle, three,  $2\frac{3}{8}$ -inch round bars. Pins,  $2\frac{1}{2}$  inches diameter. End posts, two, 8 by 10-inch pieces. First main truss ties, two,  $1\frac{1}{8}$  inches square. Stone abutments. A good structure.

No. 101, combination Pratt truss.

No. 120, a pile bridge about like others; length, 204 feet.

No. 124, a Howe Truss of 111 $\frac{1}{2}$  feet span. Panel length, 10 feet 3 inches. Width, 14 feet clear. Panels, 10. Lower chords, 5, 6, 6, 5 by 14 inches. Upper chords, 5, 6, 6, 5 by 11 inches. Clamps and keys at every panel. End panel braces, two,  $8\frac{1}{2}$  by  $9\frac{1}{2}$  inches. End truss ties, two,  $1\frac{1}{8}$  inches, and one,  $1\frac{1}{2}$  inches, not upset. Floor beams, 8 by 13 inches, 4 to the panel. Stringers, 6 by 15 inches, flat. Bearers, 6 by 15 inches.

No. 120, pile bridge.  
No. 124, Howe Truss.

#### GENERAL REMARKS.

#### Remarks.

All small structures, such as cattle guards and culverts, stated to be rebuilt this fall. Order for it said to be already given. These are now the poorest structures of the road, looking old and weak.

Small structures.

Rails are laid with joints placed opposite and not alternate. The aim is to not have suspension joints. The angle bar fastening is much used, but not altogether; but where not, the rails are notched for the spikes to prevent creeping. Rails are full spiked.

Rails.

Rails are said to give but little warning of breakage, but generally go entirely through when they start to break. They break more at the 2nd hole for fish-plates than at other points. In winter they break more on sand and gravel ballast than on stone ballast. This is believed to be because the sand and gravel ballast retains water to freeze, thus forming a solid bed, devoid of elasticity in winter, which is not the case with stone ballast. Also, as a 2nd cause, the freezing sand and gravel heaves the rails into irregular lines, which "ride" harder than the unaltered lines of rail on stone ballast.

Wint'r breaks.

The standard rail section from 1874 to 1879 was 4 inches deep,  $2\frac{9}{32}$



inches across the middle of the head, 4 inches across the foot, and  $1\frac{1}{2}$  inches thick in the stem. Weight per yard, 52 pounds. From 1879 to the present the standard has been a 59-pound rail,  $4\frac{5}{8}$  inches extreme depth,  $2\frac{7}{8}$  in. thick through the middle of head,  $\frac{1}{8}$  inch thick in stem, and  $3\frac{3}{4}$  inches wide in foot. Edges of foot  $\frac{1}{4}$ -inch thick. At the web the foot is  $\frac{3}{4}$ -inch thick. Sides of stem concave to a radius of 12 inches. Crown of rail convex to a 10-inch radius. Top side corners of head rounded to a radius of  $\frac{3}{8}$  inch. Lower corners of head rounded to a radius of  $1\frac{1}{2}$  inch. The head and foot join the stem by fillets of  $\frac{1}{4}$ -inch radius. Under side of head, except the round and fillet, flat and inclined about the same as the top of the foot. One feature of this rail wherein it differs from the most usual modern practice, consists in nearly vertical or parallel sides of head. The same fish-plate fits this rail and the standard of 1874 to 1879.

**Ties.** The length of ties was formerly 8 feet, but they are now 9 feet. Width of face,  $6\frac{1}{2}$  to  $9\frac{1}{2}$  inches, laid 3,000 to the mile, oak and elm, latter being chemically treated. Chemically treated elm costs about same as oak.

**Cattle guards.** The cattle guards consist of 3 or more long ties laid crosswise the track, in the bottom of a pit about 2 feet deep by  $7\frac{1}{2}$  feet lengthwise. On these is laid a frame consisting of 4 pieces, 12 by 12 inches lengthwise, 2 being under the rails, and 2 about 12 feet apart, all about 7 feet length, across the ends of which are spiked thick planks. On this frame the ties 6 by 8 inches flat by 14 feet long, sawed and with beveled edges, are laid, 5 or 6 in all. Outside the rails are 4 wheel guards, two on each side, bolted to ties. At each side of the guard is a reclining fence length parallel to track, from which runs the division fence.

**Pile bridges.** The standard pile bridge for the numerous nearly dry openings consists of 4 piles with 12 by 12 caps and proper bracing, with 12-foot spans, etc.

**Weight of locomotives.** The heaviest passenger locomotives have 58,000 pounds on drivers. Distance c. to c. of driver axles 8 feet 8 inches. The heaviest freight cars loaded 25 tons.

**Elevation of outer rails.** Elevation of outer rail on curves 1 to  $3\frac{1}{2}$  inches, according to curvature and location of curves.

**Specifications.** Specifications for bridges require that spans from 150 to 200 feet shall carry a rolling load of 3,000 pounds per foot. Spans of 120 feet, 3,500 pounds. Spans of 100 feet, 4,000 pounds. Small plate girders 5,000 lbs. per foot.

**Bridge inspector.** A road and a bridge inspector is employed for each 200 miles of road, whose duty it is to keep busy going over his beat and make a record and report. He is charged especially to look for flaws and rot.

**Train schedule.** Trains are run by schedule and train dispatcher.

**Application of air brakes on passenger cars.** In the passenger cars of trains a cord runs along in reach of passengers, by pulling which the air brakes are immediately applied with full force. The object of this is to enable any one in any car to apply the brakes in case of a broken axle or other accident to that car. One instance is given of the brake having been applied through curiosity, and ignorance of true office of cord.

The qualities of iron in the iron bridges cannot be stated.

V. CLEVELAND, TUSCARAWAS VALLEY AND WHEELING RAILWAY, from Black river to West Wheeling. Inspected July 22, 1881.

Gauge of track, 4 feet 8½ inches.

Structures are numbered from Black river.

No. 1, a deck Howe truss, uncovered. Span, 144 feet; panels, 14; depth, about 15 feet; width, 10 feet, clear. Over west branch of the Black river, and will be renewed next year. Lower chords, 6, 7, 7, 6 by 13 inches, with iron clamps and keys; top chords, 6, 7, 7, 6 by 12 inches, with wood keys; braces, two, 10 by 11 inches, at end; truss main ties at first panel, three, 2-inch rods; lateral ties, 1½ inches, and braces, 6 by 6 inches, top and bottom; floor beams, 6 by 12 inches, four to the panel; stringers, two, 6 by 12 inches; sway braces in seven sets; ties, 6 by 8 inches, 7 inches between; guard rails, 5 by 5 inches, bolted every third tie, and placed 12 inches out. The stringers and floor beams are the weakest parts of this bridge. Masonry abutments.

No. 1, Howe truss.

The north approach a trestling, looking old, but is to be filled within 6 months. Trestles stand on dry ground. Stringers, 6 by 15 inches, originally only two of them, but recently a new one has been added throughout. Intermediate trestles have been added to keep the structure safe till filled.

South approach trestling in similar condition, but is to be filled within 6 months, and put in good condition. Slowing of speed ordered here for the present.

No. 2, a deck Howe truss of 170 feet span, over the east branch of Black river. Chords, 7, 8, 8, 7 by 13 and 12 inches; depth of truss, 17 feet; width, 10 feet 8 inches clear; panels, 16; braces, two, 10 by 14 inches, at end panel, and main ties, three, 2½ inches. Sway braces in 9 sets. Strong quadrangular trestling put under at each quarter, to be planked outside, and filled with stone. Outside, riprap is to be placed around to anchor the trestle support. Slowing of speed of trains ordered here for the present. Floor beams, 16 feet 8 inches long, and weak from age; ties, 6 by 8 inches, and 8 inches between; guard rails, wood, 5 by 5 inches, notched and bolted every third tie. Abutment, stone masonry, in good condition at north end. At the south end the bridge stands on native rock, dressed to face.

No. 2, deck Howe truss.

North approach a good strong trestling, new, except one opening has an inverted queen-post truss of 32 feet span, with string pieces or chords, three, 6 by 16 inches. The truss rods bear at ends 7 stringers on iron shoe pieces.

Crossing of C., C., C. & I. Ry.

Half a mile south of crossing, examined two cattle guards. In good condition. Opening, 8 by 8 feet; bearers, about 8 feet long, under rails, with planks crossing them, 3 by 12 inches. Slats about 2 inches, or 3 by 4 inches, beveled. Reclining fence length at each side.

Cattle guards.

About 4 miles south of junction, examined a 2-bent trestle. Bents rotted 1 inch deep at surface, one side, where they enter the ground. Safe. Trestle timbers, 12 by 12 inches. Stringers, three, 6 by 16 inches, new. The bank bearings are trestles, partly buried and shortened by filling in the original opening.

Trestle, four miles from junction.

Between this and No. 3 is another trestle of 6 bents.

Trestle.

No. 3, a deck Howe truss, uncovered. Span, 40 feet; chords, 10 by

No. 3, Howe deck.

14 inches, solid, single sticks, oak; braces,  $4\frac{1}{2}$  by 14 inches; truss tie rods, two,  $1\frac{1}{2}$  inches; panels, 8; depth of truss, between, 4 feet 6 inches; total depth,  $8\frac{1}{2}$  feet. Under these somewhat old and peculiarly built trusses are added new oak timbers, 10 by 14 inches, forming a sort of an arch of 3 pieces, springing from the good stone abutments. The middle piece is horizontal against the underside of the trusses. The abutments are in the form of T-walls, extending into the embankments. Thickness of the branch wall extended under track about  $6\frac{1}{2}$  feet. Heavy copings extend out over about 2 feet, and seem to have split the top of the south T-wall, so as to open it about  $1\frac{1}{2}$  inches. The structure appears to be entirely safe.

Grade summit.

Between Nos. 3 and 4 is a summit in grade, two miles south of Medina.

Two trestles.

Also two trestles, first, with about 20 bents, of 16 feet spans each, and 20 feet height above ground. 4 years old. Stringers, three, 6 by 16 inches. Ties, 6 by 8 inches, 6 inches between. Iron guard rails, 6 inches, inside; and wood guard rails, 5 by 5 inches, 12 inches out, bolted every second tie. Bents consist of 2 plumb and 2 batter posts, a sill and cap, all 12 by 12 inches, with sway braces, and standing on 4 stone piers of about 2 feet square to each bent. The latter resting on rock bed. Second trestle all renewed and good. Construction like preceding.

No. 4, through Howe.

No. 4, a through Howe truss, of wood, with trusses covered separately. Built in 1878. Panels, 6; span, 46 feet; depth of truss, 8 feet; width, clear, 14 feet; lower chords, 5, 5, 5, 5 by 14 inches, single pieces. End panel truss rods, two,  $1\frac{3}{4}$  inches, at bottom of threads,  $1\frac{1}{2}$  inches. Braces in end panel, 8 by 8 inches. Floor beams, 7 by 15 inches. Stringers, two, 6 by 12 inches. Abutments of good stone masonry.

Junction with N. Y., P. & O. Ry.

Two trestles south of the junction, renewed.

No. 5, through Howe.

No. 5, a through Howe truss, uncovered, and one of the older ones. Over the Chippewa stream. Original length of truss, 110 feet; span, present, 62 feet, block to block, and in effect 4 spans; depth of truss, 20 feet; width, about 15 feet. Clamps and keys of lower chords, iron. Braces in end panels, two, 7 by 9 inches; and main ties, two,  $1\frac{1}{2}$  inches. Laterals, 6 by 6 inches, and  $1\frac{1}{4}$ -inch rods. Floor beams, 7 by 14 inches, 4 to panel. Stringers, about 10 by 12 inches. Ties, 6 by 8 inches, 10 inches between. Wood guard rail as usual, 5 by 5 inches, etc.

Trestle.

Next trestle renewed last summer. Length, 50 feet.

No. 6, through Howe.

No. 6, a through Howe truss; same size, length, etc., as No. 5. Width, 14 feet, clear. Over Chippewa stream. Trestles placed under the bridge for temporary supports at 3 panels from the ends. Floor beams, 4 to the panel. Stringers, 10 by 10 inches, clamps and keys, iron. Ties and flooring as usual. Bored lower chord, and found it sound.

Branches.

Silver creek, flag station. Branch road to coal mines. Four miles. Warwick, junction with Cleveland and Mt. Vernon Railway.

Trestle.

Next, a trestle with track in a curve. The bents are 3 oak piles with 2 diagonals spiked on for sway braces. Piles sap-rotted, but sound at the heart, and strong; caps fair; 7 years old. All above the caps renewed recently. Stringers, three, 6 by 18 inches by 20 feet length.

Massillon, junction with the P., Ft. W. & C. Railway.

Trestle.

Next, a trestle rather poor, but not dangerous, which is already

ordered by the company to be replaced by a stone arch of 10 feet diameter, with filling of dirt.

At Burr's Mills is a trestle washed and cut by ice. Several new bents put in, and new stringers put on. Several ties wanting. A de-railed car would be likely to fall. Repairs apparently incomplete. Upper works sound. Old piles, 7 years old.

No. 7, a through Howe truss, uncovered. Span, 130 feet. Panels, 12. Clamps and keys to chords, iron. Lower chords, 6, 7, 7, 6 by 13. End panel braces, 8 by 10 inches, and tie rods, three,  $1\frac{1}{2}$  inches. Depth of truss, 20 feet. Width, 14 feet. Bored at two places, and found sound wood at heart, though some of the parts of lower chord are weakened by sap-wood decay by nearly a fourth. Floor beams, 8 by 14 inches; 4 to the panel. Stringers, 10 by 12 inches. Ties, 4 by 8 inches; 4 inches between.

No. 7, Howe through.

Abutments consist of 8 piles in 2 rows of 4 each, planked and filled between with stone. All about 6 years old. This bridge appears too weak for service. It is stated that a trestle bent will be put under before winter for additional support. Four angle blocks at seats of main braces broken.

No. 8, a through Howe truss; not covered. About 6 years old. Span, 180 feet. Panels, 16. Depth, 20 feet. Width, 14 feet. Lower chords, 7, 8, 8, 7 by 14. End panel braces, 8 by 13 inches. Truss ties, three,  $2\frac{1}{2}$  inches. Lower chords drawing apart at the joints. To prevent further stretching of joints clamps are put upon the chord members at the splices. These clamps are of cast-iron and grip the chord pieces edgewise, both parts at a joint, by bolts passing vertically through from the top to the lower part of clamp. These are then connected longitudinally by rods, which run past the joint in the chord. These clamps were patented April 25, 1865. Two trestle supports are under, thus taking 7 panels out of the bridge. Floor beams 4 to the panel. Stringers, 10 by 12 inches. Abutments of piles filled in by stone. Ties, 4 by 8 inches, 4 inches between and 12 feet long.

No. 8, Howe through.

No. 9, a through Howe truss, uncovered, of 10 panels. Depth of truss, 20 feet. Width, 14 feet. Over the Ohio canal. Same age as No. 10, but in better condition. Lower chords, 6, 7, 7, 6 by 12 inches. End panel braces, two, 9 by 10 inches, and tie rods, two, 2-inch rods. Laterals, 6 by 6 and  $1\frac{1}{2}$  inches. Span, 105 feet. Built in 1872. Floor beams, probably, same as for No. 10, 7 by 14 inches. Stringers, 10 by 12. Ties, 7 by 8 inches, 8 inches between, etc. In good condition for its age.

No. 9, through Howe.

West approach to No. 9, a trestling of 5 bents and 16 feet spans. Stringers, three, 6 by 16 inches, one of the three being new.

Trestling.

No. 10, a through Howe truss, of same age as No. 9. Over the Tuscarawas river, uncovered; 2 spans of 160 feet each. Panels, 16. Depth of truss, 20 feet. Width, 14 feet. Lower chords, 7, 8, 8, 7 by 14. End panel braces, 10 by 13, and tie rods, three,  $2\frac{1}{2}$ -rods. Clamps and keys, iron. Lower chords drawing apart, indicating weakness. Floor beams, 7 by 14 inches; 4 to the panel. Stringers, two, 6 by 12. Laterals, 6 by 6 inches, and  $1\frac{1}{2}$ -inch rods. Ties, 7 by 8, and 8 inches between. Wood guard rail, 5 by 5 inches, notched, and bolted at alternate ties. Abutments of good stone masonry.

No. 10, through Howe.

East approach an inverted king-post truss of about 30 feet length,

with 2 stringers, 8 by 18 inches each. Truss rods seated on iron corner plates at end of the truss.

West approach, 16 bents of trestling, being filled with earth. This filling is stayed just now by the company, being enjoined by the court at the solicitation of the people here, not to fill this trestle in the river bottoms, for fear the embankment will impede the water of the river, causing back-water above.

No. 11,  
through  
Howe.

No. 11, a through Howe truss of 16 panels, uncovered; built in 1872. Depth of truss, 20 feet. Width, 14 feet. Chords, 7, 8, 8, 7 by 14. End panel braces, 11 by 12 inches. Ties, three, 2½ inches. Over Still-water river. Under the fourth panel is a crib filled with stone, for a support to the truss.

West approach a trestling, new and sound.

Uhrichsville and Pan Handle Road. This is stated to have been the terminus of the Cleveland and Tuscarawas Railway for seven years. It was recently extended to the Ohio river, and the structures described below are only about one and a half years old.

No. 12, pile  
bridge.

No. 12, a pile bridge of seven spans. Spans each 16 feet c. to c.

No. 13, trestle. Stringers, three, 7 by 17 inches. Age, 1½ years.

No. 13, a trestle of 28 bents to a curve in the track. Spans, 16 feet. Bents consist of two plumb and two batter posts, a sill and cap, all 12 by 12 inches, and 2 sway braces diagonally crossing each other. Bents each stand on the heads of 4 short piles.

The nut-lock used here is the Metcalf, Paul & Co.'s.

No. 14, pile  
bridge.

No. 14, a pile bridge of 4 bents, at 20 feet c. to c. Caps, 12 by 14 inches. Stringers, three, 7 by 17 inches. Ties consist of ordinary track ties, spotted to thickness, laid with 9 inches between. Guard rail, 6 by 6 inches, notched and bolted at every third tie.

No. 15.

No. 15, of same description as No. 14. These are over the Still-water.

No. 16, pile  
bridge.

No. 16, a pile bridge of about 15 bents of 4 piles each, otherwise about the same as No. 14.

Nos. 17 to 25.

Nos. 17 to 25, inclusive, all pile bridges or trestles, with 20-foot spans, and with bents from 6 to 8 in number, except No. 24, which has 12 bents. All bents have 4 piles. The heights above channel bottom run from 10 to 16 feet.

No. 26, thro'gh  
Howe.

No. 26, a through Howe Truss, uncovered, of 60 feet span. 7 feet depth of truss, 10 panels, and 14 feet width. North of Freeport. Chords, 6, 8, 6 by 13 inches. End panel braces, 8 by 8 inches, and truss ties, two, 2 inches. Counter brace, 5 by 6 inches. Truss rods not upset for threads. The middle timber of lower, double spliced in 2nd panel, and outside timbers spliced at 4th panel from ends. Upper chord, 6, 8, 6 by 9½ inches. Clamps and keys, wood. Floor beams, 7 by 14 inches. Stringers, two, 6 by 12 inches. Ties, 7 by 9 inches, 8 inches between. Wood guard rail, 6 by 6 inches, 15 inches outside, with bolts at alternate ties. Abutments, north end, 8 piles in two rows, 4 feet apart and planked. Space between planks to be filled with stone. South end, 2 framed trestles, each with 4 vertical timbers and 4 feet apart, filled in with stone.

Tunnel.

A tunnel of about 200 feet length, timbered with 10 by 10-inch timbers, 2 feet apart, and planked with 2 by 14-inch planks. Height of tunnel, 18 feet.

Nos. 27 to 45, inclusive, small pile trestle, with 4 piles to each bent, Nos. 27 to 45. and where of such height as to require them, two sway braces are put on X-fashion. These trestles are all small and low, mostly of 4 or 5 bents, and 5 or 6 feet height. Nos. 27 and 31 have 9 bents. All stringers are three, 7 by 17 inches. Bents 20 feet apart c. to c.

No. 46, a large trestle of 44 bents, 2 stories high. Bents stand each No. 46, trestle. on 4 pile heads, cut off a little above ground. Greatest height of bents, sill to cap, 30 feet. Bents consist of 2 plumb and 2 batter posts, a sill and cap, all 12 by 12 inches, also a girt strip at mid-height, with crossing sway braces in the lower and upper parts, or panels, bolted at all the timbers crossed. Made of oak timber. Steel rails laid on this trestle, though the road has iron rails from Uhrichsville to the Ohio river.

No. 47, a pine trestle like 49, soon to be described.

No. 47, trestle.

No. 48, an oak trestle made like No. 46.

No. 48, trestle.

No. 49, a large trestle which is truly remarkable for its height, quantity of lumber, great number of sticks in bents, complex framing, good workmanship, and strength. Height, 55 feet; length, 640 feet. Total lumber, 350 M feet of pine, all 8 by 8 inches, and 3 by 10 or 4 by 10-inch spans, 16 feet c. to c. Built to a curved track. Caps, three, 5 by 10-inch pieces, 18 feet long. Ties, 16 feet long, with bearers under the ends. A wood guard rail, 12 inches outside, and a ribbon at ends of ties. No. 49, trestle.

The bents each stand on 8 piles. The bents themselves are of very peculiar construction, and stated to be such that any stick can be taken out and replaced by a new one, without giving any attention to passing trains. Thus the whole immense structure can be rebuilt entire, stick by stick, with no inconvenience to traffic. This end was evidently in view when the ingenious design was made.

Each single bent is described thus: In general there are 2 plumb posts and 2 batter posts, girts and braces. A plumb post consists of four 8 by 8-inch sticks, so arranged, that a 3 by 10-inch stick running crosswise the track separates them by pairs. Also an 8 by 8-inch stick, running lengthwise the track, separates them into pairs. The 8 by 8-inch stick lies above and in contact with the 3 by 10 stick. Thus the four 8-inch sticks forming a post are separated 8 inches one way and 3 inches the other. Outside the 8-inch sticks of post, both sides, is a 3 by 10-inch stick parallel to the between 3 by 10 inches, all crosswise the track, and running similarly by the other post and batter posts. Bolts go through these three 3 by 10-inch girt pieces and the 8-inch sticks of posts, two bolts at each plumb post. At the batter posts the two 8-inch sticks have one 3 by 10 inches between, and one each side, with one bolt through all. Also, the longitudinal 8 by 8-inch sticks between the 8 by 8-inch sticks of posts have a bolt through at intersections. A longitudinal stick 4 by 10 inches is fastened on outside the batter posts, and lying on the crossing girt pieces. This system of girt and longitudinal sticks is placed at each 10 feet in height, thus dividing the bents into panels of 10 feet each in height. Braces on outside of posts and batter posts run from the outer ends of a girt strip upward and toward each other, and meet at the underside of the next girt above. These are spiked on. The upper girts are three, 5 by 10 inches by 18 feet long, forming the cap to the bent.

The stringers are three, probably 7 by 17 inches, all in excellent condition.



Nos. 50, 51 and 52, trestles.

Nos. 50, 51 and 52 are also large trestles, 350, 300, and 550 feet long, by 40, 40, and 55 feet height, respectively, and built of pine and similar construction to No. 49; also have wide deck.

Tunnel.

A tunnel, 1,453 feet long, timbered throughout with 10 by 10-inch sticks, 16 inches apart at south end, and 10 or 12 inches apart at the middle of tunnel, with planks 2 inches thick outside, all white oak. Tunnel cut in limestone rock, from which pieces were liable to detach and fall. The timbers have vertical posts at sides, capped by a plate, from which plate two inclined pieces rise to meet a horizontal "key-stone" piece above by a gained joint.

Nos. 53 and 54.  
Nos. 55, 56, 57  
and 58.

Nos. 53 and 54, small combination trusses.

Nos. 55, 56, 57 and 58, through combination Pratt trusses of 75 feet span,  $22\frac{1}{2}$  feet depth of truss, 14 feet width between trusses, and 6 panels. Lower chords at the end, two,  $1\frac{3}{8}$  inches, square; at middle, two, 1 by 3 inches; end main truss ties, two,  $1\frac{1}{2}$  inches square; end posts, three, 6 by 12 inches; pins,  $2\frac{1}{2}$  inches diameter; floor beams at panel points consisting of three, 6 by 18 inches, wood; stringers, three, 6 by 14 inches. Laterals between stringers and floor beams. Abutments masonry.

No. 59.

No. 59, a 30 feet span, 3 panel Pratt or Howe truss, combination (see No. 70).

Nos. 60, 61, 62  
and 63, Pratt  
combination  
trusses.

Nos. 60, 61, 62 and 63, Pratt combination trusses; one panel longer than No. 55, otherwise same, except dimensions.

Nos. 64 and 65,  
through com-  
bination Pratt  
trusses.

Nos. 64 and 65, through combination Pratt trusses of 8 panels.

No. 66, combi-  
nation Pratt.

No. 66, a through combination Pratt truss of 9 panels.

Culvert.

No. 67.

No. 67, same as 64.

No. 68.

No. 68, a combination Pratt of 11 panels.

No. 70, Pratt  
combination.

No. 70, a 34 feet span, 3 panel combination truss, Pratt style, except that the rectangular middle panel has braces, 6 by 8 inches, instead of tie rods. It is the queen-post, or rather queen-rod style, with braces in middle panel, except the vertical members between panels are two  $1\frac{3}{8}$ -inch iron rods, and lower chords, iron, two,  $1\frac{3}{8}$ -inch rods. The inclined end posts and top chord are 10 by 12 inches, wood. Floor beams, two, 7 by 17-inch sticks.

Tunnel.

A tunnel, about 400 feet long, timbered like others.

No. 71, Pratt  
combination.

No. 71, an 8-panel Pratt combination.

Culvert.

Nos. 72 and 73.  
Culverts.

Nos. 72 and 73, 6 panels, like 55.

Culvert. All culverts along here have masonry abutment walls.

Culvert.

No. 74, Pratt  
through com-  
bination.

No. 74, a through combination Pratt truss of 7 panels, 64 feet span, and 17 feet depth of truss. End posts, three, 6 by 10 inches, pine. First main truss ties, two,  $1\frac{5}{8}$  by  $1\frac{5}{8}$  inches, iron; next, two,  $1\frac{5}{8}$  by  $1\frac{5}{8}$ . Vertical tie between first and second panel, one,  $1\frac{1}{2}$  inches square. Lower chords at end panel, two,  $1\frac{5}{8}$  by  $1\frac{5}{8}$  inches; next panel, two,  $\frac{7}{8}$  by 3 inches.

Nos. 75 and 76,  
through com-  
bination  
Pratt.

Nos. 75 and 76, a through combination Pratt; 2 spans, of 106 feet each, with 8 panels, and  $22\frac{1}{2}$  feet depth of truss. Inclined end posts and top chords, pine, three, 7 by 14 inches. First main truss rods, two,  $1\frac{7}{8}$



inches square; next, two,  $1\frac{1}{2}$  inches square; next, two,  $1\frac{1}{2}$  inches square; next (counter), one,  $1\frac{1}{2}$  inches round; next (counter), one,  $\frac{1}{2}$ -inch rod. The one remaining square panel without a counter tie. Vertical tie between first and second panel, one,  $1\frac{1}{2}$  inches square. Bottom chords at end, two,  $1\frac{1}{2}$  inches square; next, about two,  $1\frac{1}{2}$  by 4 inches; next, two,  $1\frac{1}{2}$  by 4 inches; next, two,  $1\frac{1}{2}$  by 4 inches, at middle.

No. 77, same style of Pratt; 11 panels.

Tunnel, timbered.

No. 78, like 77. Culvert.

Nos. 79 and 80, Pratt combination, like 84. Culvert.

No. 81, a 9-panel Pratt combination.

Nos. 82 and 83, like No. 84, all through Pratt combination trusses with "double intersections." The term double intersection here refers to the fact that the main truss ties cross diagonally over 2 panels. This style of truss is sometimes termed the Whipple, and sometimes the Linville.

In No. 84 the span is 175 feet. Depth of truss, 27 feet. Width, 15 feet. Panels, 13. Inclined end posts and top chord, pine, four, 8 by 17 inches. First truss columns, two, 8 by 10, pine. Vertical tie between first and second panel, one,  $1\frac{1}{2}$  inches square. First main truss ties crossing diagonally over second panel, two, 2 by 2 inches. Second main truss ties crossing diagonally over the second and third panels, two, 2 by 2 inches. Next two,  $1\frac{1}{2}$  inches square. Next two,  $1\frac{1}{2}$  inches square. Next two,  $1\frac{1}{2}$  inches square. Next two,  $1\frac{1}{2}$  inches square. Next (counters), two, 1 inch square. Next (counter), one,  $\frac{1}{2}$ -inch rod. Next (counter), one,  $\frac{1}{2}$ -inch rod and last. Lower chord ends, two, 2 by 2 inches. Second panels, two,  $\frac{3}{4}$  by 5 inches. Third panels, two,  $\frac{3}{4}$  by 5 inches, and two,  $1\frac{3}{4}$  by 5 inches. Fourth panels, four,  $\frac{3}{4}$  by 5 inches. Fifth panels, four,  $1\frac{1}{2}$  by 5 inches. Sixth panels, four,  $1\frac{1}{2}$  by 5, and two,  $\frac{3}{4}$  by 5 inches. Middle panels, four,  $1\frac{1}{2}$  by 5 inches, and two,  $\frac{3}{4}$  by 5 inches. Floor beams, three, 6 by 18 inches, pine. Excellent masonry abutments. A large stone under each bridge pedestal.

All the above bridges numbered from 53 to 84, inclusive, are of the class known as the combination—that is, the compression members are wood (pine in the present case), and the tension members wrought iron. Also the floor beams and stringers are wood. The wooden parts of the trusses are all painted with what appears to be the so-called mineral paint of a brownish red color. The wooden parts are not covered. The iron posts have pin connections, and the wooden struts terminate in iron fittings with pin holes; where several wooden pieces combine in one member they are stayed at an intervening space of about an inch. They are generally through bridges; in the above set on masonry, and everything apparently in excellent condition.

These combination bridges were all made by the Smith Bridge Company of Toledo, Ohio, after well matured designs, and of good workmanship. The maximum live load assumed in figuring these bridges, is stated by the Smith Bridge Company to have been 2600 pounds per foot.

No. 77.

Tunnel.

No. 78.

Nos. 79 and 80,

Pratt.

No. 81, Pratt.

Nos. 82 and 83.

Pratt combination.

No. 84.

Combination  
bridges in  
general.

## Remarks.

## GENERAL REMARKS.

Road north of  
Uhrichsville.

The engineering work of this road north of Uhrichsville is very different in appearance from that south of that place. The larger structures of the former portion are mostly old, becoming weak, and strengthened with added parts and supports. Some of the bridges are of peculiar and unusual design. But there is ample evidence of close watchfulness of all these structures, as indicated by the prompt application of provisional supports, such as trestle bents under lame bridges, an additional new stringer in old trestles, slowing of speed of trains over critically safe works, etc. Also the renewals which are in progress are of a substantial character.

South of  
Uhrichsville.

But south of Uhrichsville, as has been stated, the road is new, because this place was the southern terminus until about one or two years ago. Hence, the structures are here new and sound, and many of them costly. The country, being very uneven, has required high and long trestles, numerous tunnels and many bridges. But all of these are first-class as regards workmanship, and apparently so as regards materials, and the trestles are the most remarkable of any found in the State for magnitude, elaborate design, and provision for repairs without interruption of trains. The bridges, however, are believed to be rather light for the heavier locomotives and freight trains, say engines and tenders of 148,000 pounds to 50 feet length.

Trestles.

Rails.

The rails, from Cleveland to near Canal Dover, are steel, and 56 pounds with angle-bar fastenings per yard. The better old rails, as taken up for laying steel, have been relaid on the new portion south of Uhrichsville. The iron rail fastenings are fish-plates. Rails are all laid with suspension joints, and alternating with those of the opposite rail.

Ties.

The ties are all new; those of the north portion of road having been renewed. They are laid 2600 per mile. The ties used here are largely the so-called Virginia ties of white oak and broad face. Width of these ties run from 10 to 12 inches.

Grades.

The maximum grades going south are 30 feet per mile, except at Flushing, Belmont county, where there is a 3-mile grade of 55 feet. Maximum going north is the 45-foot grade on the south slope to the summit, at Summit, Medina county.

In hauling coal trains, much longer trains are taken by one engine from Summit northward than to Summit from southward, on account of the grades. For this reason trains are broken, and remade at Summit.

At this point weighing scales are located, and as the trains are made up the coal-loads are weighed.

Cattle guards.

The cattle guard of this road, adopted as standard, is well marked in character and believed to be one of the best in use in the State. For a full description and illustration see the article on Railroad Economics in this report of the Commissioner.

The small structures of this road, such as cattle guards, culverts, and short, low trestles, are all in excellent condition, and give evidence of close attention to details, such as have to do with safety. In short, the whole road is in good condition; in fact, excellent for a north and south one, with the exception of a few of the larger bridges on the north portion, but these are closely watched, have provisional supports, and early renewals are contemplated.

Respecting the quality of materials put into structures, a fair judgment of wood and stone may be obtained from the appearance of the same as seen in the structures, but for iron the case is different. The fact that the simplest mode of inspection for qualities of iron requires bending and breaking tests, debars the determination of toughness, tensile strength, elastic limit, etc., on the spot. Hence, nothing is stated respecting the goodness of the iron in the combination and other bridges of this road.

Quality of material.

## VI. PENNSYLVANIA COMPANY'S LINES IN OHIO.

Gauge of track, all branches, 4 feet 8 inches.

1. Pittsburgh, Fort Wayne & Chicago Railway, parts of the Eastern and Western Division, via Leetonia, Alliance, Crestline, and Van Wert, beginning at the State line east, and ending at the State line west. Structures are numbered by the Railroad Company from east toward the west.

a. Eastern Division, State line to Toledo Junction; inspected Eastern Div.—August 25, 1881.

No. 10, an iron through plate girder. Span, 40 feet; length, 44 feet; depth of girder, 4 feet. One track and one span. Built in 1879, over Bull creek. Rail above channel bottom, 12 feet. Distance from Pittsburgh, 56 miles.

No. 10, plate girder.

The girders are composed of web plates, between top and bottom flanges or chords, entire in depth, but spliced in length. Angle bars are riveted in on both sides of web, between flange plates and web. The upper and lower flange plates or chords are straight and parallel for the whole length of the bridge, except the rounding of the upper end corner to a radius of about a foot, so that the upper flange plate makes an easy turn at the ends of the girder, and extends down vertically to meet the end of the lower flange or chord. The midspan portions of the chord flanges are thickened by pieces laid on. The web plate is stiffened against buckling by vertical stays, riveted on from top to bottom. These are made of angle bars, and are nearest together at the ends of the girder.

The floor beams are iron and made of a web plate, a top and bottom flange plate and 4 angle bars riveted in between. Angle or sway plates are riveted in between the floor beams and the main girders, for the purpose of keeping the girders erect, and to prevent side deflection of the top chords or flanges. The floor beams rest on the lower chord flange inside, and are secured by rivets. The stringers are in the same plan as the floor beams, but of less depth, and connected by strips of angle bar or bent plate, riveted to stringers and floor beams. The stringers are in pieces, going from one floor beam to the next.

Aggregate section for compression in the upper chord, at midspan, including only the flange plates and angle bars, joining them to web,  $\frac{7}{8}$  by 12 inches + 15 by  $\frac{1}{2}$  inches = 18 square inches, for one girder. Lower chord section somewhat larger by about the section cut away for rivets. Angle bar web stays, 3 by 3 by  $\frac{1}{2}$  inches. First stay from end of girder, 20 feet; this to the next, 4 feet; in all, 9 stays. Angle or sway plates, 16 inches wide at floor beams by  $\frac{3}{8}$ -inch thick. Floor beams, 21 inches deep; flange plates, 8 $\frac{1}{2}$  inches wide; web,  $\frac{7}{8}$ -inch

thick; angle bars, 3 inches; stringers, 5 by 14-inch I-beams; laterals,  $\frac{3}{8}$  by 4-inch bars. Under floor beams flat; track, straight. Ties, 7 by 8 inches, flat, notched slightly on stringers, placed with 6 inches between. Wooden guard rails. 16 inches outside of rails, 7 by 8 inches, notched and bolted. No iron guard rail. Three full floor beams, with a half floor beam at each end of bridge. Floor beams same as lateral struts. A substantial structure.

No. 11, Pratt. No. 11, an iron Pratt deck truss; 2 spans, 1 track. Length, 64 feet each. Keystone make, 1870. Depth of truss, 9.8 feet. Panels, 8.

Upper chord, two channel bars, 9 by 2 inches, and a web plate, 12 inches. Lower chord continuous, not eye-bars; at middle of bridge, two,  $\frac{7}{8}$  by 6 inches, and two,  $\frac{5}{8}$  by 6 inches, each truss. Columns, swelled Phoenix, stand on pedestal plates, which rest on the lower chord. A block below pedestal on underside of chord to hold ties of truss. First main tie, two,  $2\frac{1}{2}$  inches-square rods. End posts, swelled Phoenix keystone columns,  $1\frac{1}{2}$  by 12 inches. Sway ties,  $\frac{1}{2}$ -inch rods. Laterals, 1 inch, and 1 panel each for 2 panels, then 2 panels each. Top, all two panels each. Floor beams, two, 4 by 10-inch I-beams, stayed. Stringers,  $4\frac{1}{2}$  by 10 $\frac{1}{2}$ -inch I-beams. Ties, 6 by 8-inch oak, flat, 6 inches between. Guard rails, wood, 7 by 8 inches, edge 15 inches out, bolted every alternate tie. Bearers under guard rail, 8 by 12 inches, bolted through guard.

No. 12, plate girder.

No. 12, a through plate girder, iron; 2 tracks, 2 spans of 60 feet, and length, 65 feet each. Depth of side girders, 6 feet; middle one, 7 feet.

Section upper chord,  $1\frac{1}{2}$  by 12 +  $18\frac{1}{2}$  =  $28\frac{1}{2}$  square inches; 6 stays for web,  $\frac{3}{8}$  by  $3\frac{1}{2}$  inches. Floor beams on lower flange of girders 26 inches deep, by  $8\frac{3}{8}$ -inch flanges. Stringers,  $5\frac{1}{2}$  by 14-inch I-beams, resting on floor beams, and stayed to position by bracket strips. Angle plates, 22 by  $\frac{3}{8}$  inches.

Three girders in all. 1880. Over Mahoning creek; rails, 33 feet above stream. Near Alliance, east.

No. 14, Howe. No. 14, a through Howe wood truss. Length, 47 feet. Depth, 8.3 feet c. to c. One span and track. Panels, 8. Braces,  $7\frac{1}{2}$  by 10 inches. Main ties, two,  $1\frac{5}{8}$ , one  $1\frac{1}{4}$  inches. Counters,  $6\frac{1}{2}$  by  $6\frac{1}{2}$  inches. Lower chords, 6, 7, 7, 6 by 12. Floor beams, 7 by 14. Laterals,  $1\frac{1}{2}$  and 6 by 6. Ties, 6 by 8, flat, 6 inches between. Guard rail, 16 inches outside, bolted. Ties run 16 inches further out to a bearer. This was built in 1872. Has decayed places. Appears untrustworthy. It is stated that this will be replaced by an iron structure within one year.

No. 15, Howe. No. 15, a wood Howe, same age; 62 feet long. To be replaced by iron also within a year. Over Mahoning creek;  $10\frac{1}{2}$  feet to rail.

No. 16, iron Pratt.

No. 16, an iron Pratt truss, 1876, through.  $85\frac{1}{2}$  feet long; one track and span. Depth of truss, 20.2 feet. Over Mahoning creek;  $13\frac{1}{2}$  feet to rail. End posts, 9-inch channel bars, and 12 by  $\frac{1}{2}$ -inch plates. Lower chords at middle, two,  $1\frac{1}{8}$  by 4 inches. Main end ties, two,  $1\frac{1}{2}$  by 3 inches. Columns, American Bridge Co.'s, 8 by 8 inches. Floor beams suspended, 8 by 18 inches web, flange and angle bars. Stringers, web and angle bars, 15 by 11 inches, resting on beams. Guard rails, 21 inches outside, oak; 6 by 8 notched. Bolts, 4 feet apart. Ties, 6 by 8, oak. Laterals,  $1\frac{1}{4}$ -inch rods below.

No. 17, a through Pratt iron truss; 21.5 feet depth truss. One span, No. 17, Pratt.  
one track; 79½ feet long Mahoning river, 13 feet to rail; 1878. Panels,  
5. End posts, 9-inch channels and 2 by ½-inch plates, and laced inside.  
Columns, laced 7-inch channels. Lower chords at middle, two, 4 by  
1½. Floor beams suspended, 23 by 12½ inches; ½-inch web and angle  
bars. Stringers, web and angle bars, 15 by 9 inches; web, ¾-inch; angle  
bars, 4½.

A culvert, 15-inch I-beams, 50 pounds per foot, set on iron chairs.  
Laterals, wood, 3 by 10 diagonal, and rods Howe truss style.

No. 18, Howe through truss; 58 feet span; 9.3 feet depth; 1874. No. 18, Howe.  
Mahoning creek; 12 feet to rail. 8 panels. Braces, 7 by 9. First main  
ties, two, 1½ inches. Lower chords, 5, 5, 5, 5 by 12. Floor beams, 7 by  
14; 4 to panel. Trestle under for support, 4 or 5 feet from each end.  
Stone abutments poor; joints failing. Stringers, 10 by 12, edge. Ties, 4  
by 8, oak; old. Guard rails, 5 by 5, bolted every third tie. Ties reach  
beyond and rest on bearers.

No. 19, a through deck double triangular truss of iron. Span, 71 No. 19, trian-  
feet. Length, 74 feet. Depth of truss, 9½ feet; by Keystone Bridge gular.  
Company, 1871. One span, one track. Over the east branch of the  
Ninishillen creek. Upper chord has 7 bays. Lower, 8 full bays. A  
vertical tie at the inside end of end bay, but no other vertical ties.  
Both posts of the double system of triangular trussing terminate at the  
top of the inclined end posts; one directly, and the other by means of  
the vertical tie. End posts, 14 by ¾ inches, and other struts inclined;  
and swelled, or Keystone Phoenix columns. First main ties, two, 1½  
inches square. Second, two, 1½ inches square. Lower chord, third bay,  
two, 1 by 5½ inches of eyebars, with 3-inch pins. Middle bays, two, 1  
by 7 inches. The third tie diagonal, made to serve both as strut and  
tie, and formed of 2 channel bars, each 4½ wide and 10½ inches apart at  
middle bent, swelled and held apart by rivets through thimbles of pipe,  
the latter keeping the bars apart. Floor beams of 4 by 15-inch I beams,  
overreaching trusses about 20 inches, from which sway braces go to tops  
of trusses; braces composed of T bar iron, 2½ by 5 inches. Stringers,  
pine, two, 6 by 15 inches under each rail. Floor about like others of  
standard. One vertical tie at end, loose.

No. 23, iron plate girder. East approach wood girders. Also west No. 23.  
approach.

No. 24, being rebuilt in iron.

No. 24.

No. 25, a through half Howe wood truss. Length, 47.6 feet. Depth No. 25, Howe.  
of truss, 8.8 feet c. to c. Built in 1875, painted but not covered. Ap-  
parently sound and strong; over Fremont street, Massillon, 14.6 feet  
high.

No. 26, a Howe through; 2 spans, one track, wood. 28 panels. No. 26, Howe.  
Standing up well. To be replaced with an iron structure this year.

No. 27, an iron through plate girder, 44 feet long, 4 feet deep; built No. 27, plate  
in 1881. Over Newman's creek. girder.

No. 28, an iron through plate girder over Newman's creek; 10 feet No. 28, plate  
from stream to rail. Built in 1881. Top chord section, 1½ by 12 + girder.  
about 9 inches = about 28 square inches each truss. Depth, 5 feet; 2  
tracks.

No. 29, plate girder.

No. 29, a through iron plate girder. 43 feet long. 3.7 feet depth of truss; built in 1874. Over Newman's creek. One girder heavy for carrying half of another track, when two tracks shall be laid. Floor beams, wood, 9 by 12 inches, about 24 to 30 inches apart. Number of vertical stays, 9. Top chord section about 21 square inches at mid-span. Ends of girder with no finish, except one of the vertical stays. Stays of T bar iron, 5 by  $2\frac{1}{2}$  by  $\frac{7}{8}$  inches thick each branch.

No. 30, through iron girder.

No. 30, a through iron plate girder. 65 feet long. 6 feet deep; made in 1878. Over Newman's creek. 13.5 feet above stream to rail. Stays to web, 11 in all, and nearest each other at ends of truss of L section. Section of top chord at middle, about 20 inches. Floor beams, 20 inches deep; 4 to span.

Junction.

Junction with Cleveland, Mt. Vernon and Columbus Railway.

No. 31, plate girder.

No. 31, an iron plate girder; 43 feet long; 3 feet 7 inches depth of truss. Built in 1875. Over Sugar creek. Vertical stays to web, 9, and made of T-bar iron, 5 by  $2\frac{1}{2}$  by  $\frac{1}{2}$  inches, one at end. Upper chord section, about 14.5 inches; lower, about 16 inches. Floor beams, pine, 9 by 12 inches, about 30 inches apart; resting on lower flange. Laterals,  $\frac{3}{8}$ -inch rods.

No. 32, through triangular truss.

No. 32, a through full double triangular truss, of iron. Peculiar construction by Iron City Bridge Works of Philadelphia, Pa., in 1874; 2 tracks, 1 span of 72.8 feet, over Henry street, Wooster; 17.4 feet over street; panels, 14; depth of truss, 8.7 feet. Upper chord made of a vertical web, plate,  $\frac{3}{4}$  by 13 inches, with angle bars riveted on at top edge, across all of which a flange plate, 12 inches wide, is riveted. Section of all at mid-span, about 31 inches. Lower chord similar in form, but about 31.5 inches section. The main ties, two,  $\frac{3}{4}$  by 6 inches, at end of truss. Main struts, two T-bars, 2 by 5 by  $\frac{5}{8}$  inches each, at end of truss, lying outside the tie rods at the crossing point. Three trusses for the two tracks, the middle one carrying its half of the two tracks, and consequently made larger. Sway braces for the trusses L-iron, run from channel star bars, crossing from truss to truss upward, obliquely to the top. Placed inside of the trusses. Laterals,  $\frac{1}{2}$ -inch rods, combined with the cross stays just mentioned. Floor beams, pine, 10 by 14 inches; 21 to whole bridge.

No. 33, Pratt.

No. 33, a through iron Pratt truss of peculiar construction; 10 panels, 2 spans, of 71 feet each, and 8.1 feet depth of truss. Made in 1874. Over Beam street, Wooster. Two tracks. Upper chords, two, 9 inches, channel bars and cap plate, 13 inches wide. Bottom chords in fourth panel, two,  $\frac{5}{8}$  by 6 inches, and two,  $\frac{3}{4}$  by 6 inches. This chord continuous, and not of eye-bars. The columns are of 4 quarter cylinder pieces, stayed by through rivets and thimbles in cylindric form, with open spaces. Columns have pedestals at top and bottom chords for bearing; a plate at lower edge of lower chord is riveted on under the pedestals with pins, to hold the ties of truss. First main ties, two,  $2\frac{1}{2}$  inches square. The above is for the outside trusses. The middle truss between the two tracks is heavier, to carry the half of both tracks. Depth and length same as for the others, but of heavier sections. First main ties, two,  $2\frac{1}{2}$  by 3 inches. Laterals,  $1\frac{1}{4}$  inches, round rods, and double channel bar struts stayed by rivets and thimbles. These channel bar struts bear sway braces inside of trusses, going obliquely up to top chord. Floor



beams, pine, 7 by 16 inches, 4 to the panel. Ties, 6 by 8 inches, flat, oak. Guard rails, pine, 8 by 8 inches, bolted. The ties are decayed to a considerable extent, and new ones should be added.

No. 34, same as No. 32, in build and strength.

No. 34.

No. 35, a through Howe wood truss; span, 51 feet; depth of truss, 20.5 feet. Built in 1875. Over Apple creek. Looking old, but standing to its work well. Will be replaced by iron within a year.

No. 36, a through iron Pratt truss of 100 feet span, and 21 feet depth of truss. Made by the Keystone Bridge Co. in June, 1874. Over Kilbuck creek. Panels, 7. End post, Keystone columns, 13 by  $\frac{5}{8}$  inches. First main ties, two,  $2\frac{1}{2}$  inches square. Lower chords at middle, four, 1 by  $3\frac{1}{2}$  inches. This is for one side of the bridge. The other side is heavier, for a double track. First main tie,  $1\frac{1}{2}$  by  $4\frac{1}{2}$  inches. Lower chords at middle, four, 1 by 6 inches. Floor beams, three, 6 inches by 1.4 feet. Bearers, one, 6 inches by 1.4 feet. Ties, 6 by 8 inches, oak, 8 inches between. Guard rails, 6 by 8 inches, notched and bolted every 5 feet. Laterals,  $1\frac{1}{2}$  inches, top and bottom. Ties poor. New ones should be added.

No. 36, Pratt.

No. 39, a through Pratt iron truss, by the American Bridge Co. of Chicago; like No. 16. 2 spans of 83 feet; 1 track; depth of truss, 20.2 feet; 1876. Over Lake Fork. 17.3 feet above water to rail.

No. 39, American Bridge Co., Pratt.

No. 41, a through Pratt iron truss; 75 feet span, 21.2 feet depth of truss. 1876. Over Lake Fork. End post of a 13 by  $\frac{3}{4}$ -inch plate, on edges of two 9-inch plates, with angle bars riveted to latter to form channel bar section. Inside laced, to form a box closed on three sides. First main ties, two,  $1\frac{1}{2}$  by 2 inches; bottom chord, middle, two,  $1\frac{1}{2}$  by 3 inches; 5 panels; laterals,  $1\frac{1}{2}$ -inch rods; floor beams, 24 inches deep, 8 inches wide, by  $\frac{3}{4}$ -inch thick, on flanges with angle bars in corners. Stringers similar, 16 by 8 inches, with parts, all  $\frac{5}{16}$ -inch thick. Ties, 6 by 8 inches, 6 inches between, flat. Guard rails, 6 by 8 inches, flat, bolted, 16 inches out from rails. Ties overreach the guard rails. Stream to rail, 25 feet.

No. 41.

No. 42, a 2-span double triangular truss, of 80 feet each span, and 10.3 feet depth of truss. Over Lake Fork. Lower chord, 8 bays; upper, 6 bays, one vertical tie at end. First main ties, two,  $1\frac{1}{2}$  by  $2\frac{1}{2}$  inches, one truss. Lower chords at middle, four, 1 by 8 inches, Keystone columns for struts. Two pieces serve both as strut and tie. Floor beams, wood,  $4\frac{1}{2}$  by 14 inches. Stringers, two, 6 by 15 inches. Laterals,  $1\frac{1}{2}$  inches. Sway braces inside running up obliquely from cross struts to top of truss.

No. 42, triangular truss.

No. 44, a 2-span deck 1 track iron Pratt truss; over Black Fork; 100 feet span. Keystone end posts vertical. First main ties, three,  $2\frac{1}{2}$  inches square. Bottom chords, middle, four,  $1\frac{1}{2}$  by 8 inches. Columns in truss Keystone. Laterals, 1 inch, round. Bottom stay 2 channel bars,  $5\frac{1}{2}$  by  $6\frac{1}{2}$  inches. All made by the Keystone Bridge Co. Bridge has 3 trusses, and made for 2 tracks. First main ties to middle truss, four,  $1\frac{1}{2}$  by 6 inches, in and end half panel for skew abutments. Next main ties, two,  $\frac{5}{8}$  by 6 inches, and two  $1\frac{1}{2}$  by 6 inches; 12 sway ties, 1 inch. Portal sway ties, one,  $1\frac{1}{2}$  inches square. Pins of middle truss about 4 inches, and of the side truss about 3 inches. Top laterals at end  $1\frac{1}{2}$  inches round, and smaller at end span; bottom, 1 inch.

No. 44, Pratt.

Upper chord composed of 2 channel bars, 9 inches, and 2 I-beams between, riveted to a cup plate, 22 by  $\frac{1}{4}$  inches.



Floor beams, 24 by 10 by  $\frac{7}{16}$  inches thickness of web. Flanges formed of angle bar. Stringers, of 4½ by 11-inch I-beams. Ties, 7 by 8-inch oak, 6 inches between. Guard rails, 8 by 8 inches, bolted at every 4th tie, 18 inches out. By Keystone Bridge Co. Depth of the middle truss, 42 inches higher than the side trusses. Beams suspended to upper chord of middle truss.

Nos. 45 and 46. Pratt Truss. Nos. 45 and 46, a through iron Pratt Truss. Spans, 92 and 85 feet, 2 spans to each bridge, same style as No. 17.

No. 47. No. 47, same as Nos. 39 and 16, on good stone piers.

No. 48, through Pratt. No. 48, a through Pratt iron truss, 122 feet span. Made by the Keystone Bridge Co. in 1872; oldest on the road. Over Black Fork; panels, 9. Lower chord at middle, four, ½ by 6 inches. Main tie at end, two, 2½ inches square. Columns of Keystone style.

Floor beams, 5 by 15-inch I-beams. Stringers, two, 7 by 18 inches, wood. Bearers, 6 by 18 inches. Ties, 6 by 8-inch oak, 6 inches between. Guard rails, 6 by 6 inches, bolted every 6 feet. Laterals at bottom, 1½ inches square; laterals also at top.

No. 49. No. 49, a deck Pratt iron truss; span, 80 feet. Depth of truss, 7.6 feet. Built in August, 1869, over Rocky Fork. Panels, 12. Main ties at end, two, 2½ inches square. Width of bridge, 10 feet, truss to truss. Columns vertical, same style as No. 11. Floor beams wood, 9 by 14 inches, about 2½ feet apart.

No. 50, deck Pratt. No. 50, a deck Pratt iron truss; span, 63 feet; 10 feet depth. Over Rocky Fork. Made in 1876 by the Keystone Bridge Co. Columns of Keystone type. Main ties at end, two, 2 by 2 inches. Width of bridge about 10 feet. Floor beams iron. Flooring about as in others.

W. Division. b. Western Division, Toledo Junction to west State line; inspected August 26th and 27th.

Nos. 1 to 24, small structures, such as stone and wooden culverts; some of them are arched culverts.

No. 25, Pratt. No. 25, an iron Pratt through truss, 1 span and track. Length, 124 feet. Depth of truss, 22 feet. Over Sandusky river; 29 feet stream to rail. End posts of two 3 by 12-inch channel bars, and top plate, ½ by 16 inches. Inside laced. Lower chord at middle, two 1½ by 4-inch eye-bars. Main tie at end, three, 1 by 6 inches. Truss columns of 2 bars, with crimped iron strip riveted between them for staying. Panels, 8. Floor beams riveted at ends to columns, and composed of a web 26 inches deep. Flange plates, 10 by ½ inches wide, and 4 angle bars, 3 by ½ inches in angles. Built in 1880.

Nos. 27, 39, 46 and 37, stone culverts; first 3 arched, 9 to 16 feet in diameter, other Nos. wood culverts to No. 51.

No. 51, Pratt. No. 51, an iron deck Pratt Truss, 88 feet long. Depth of truss, 9 feet 4½ inches. Built in 1871, over Broken Sword creek; 29.8 feet stream to rail.

End post vertical. Bridge seats at ends of lower chord. Panels, 10. End posts and columns of Keystone column style. Lower chords, continuous post columns, the latter being seated as in No. 33 of Eastern Division, also, the truss ties secured in the same way to a plate riveted to lower edge of lower chord members. Lower chord at middle, four, 1½ by 6 inches. Main truss tie at end, two, 2½ inches square. Counter tie rods throughout, and at end panel it is one, 1-inch square. Upper

chord of I and channel bars, and top plate. Sway braces,  $\frac{1}{2}$ -inch rods, and a pair at each panel. Portal or end sway braces the same. Laterals top and bottom of  $1\frac{1}{2}$ -inch rods. Ties, 5 by 7 inches on edge, 6 inches between. Guard rail outside, standard.

No. 69, a two-span iron deck Pratt Truss, each 106 feet long, built in January, 1874, over Sandusky river; 33 feet stream to rail. Panels, 10. Depth of truss, 8.4 feet. Lower chord at middle, 4, 1 by 8 inches. Main end tie, two,  $2\frac{1}{2}$  by 4 inches. Columns of Keystone style. Upper chord of 3 channel bars, 10 by  $\frac{3}{4}$ -inch web, and capped with a 15 by  $\frac{5}{16}$ -inch plate. Floor beams wood, 9 by 12 inches. Stringers, 6 by 12 inches, flat. Laterals top and bottom,  $1\frac{1}{2}$ -inch rods. Sway ties, 1-inch rods, one set to each panel. Woodwork unsatisfactory, but all to be renewed soon.

No. 76, a two-span, 1-track through double triangular iron truss of 60 feet span each. Depth of truss, 7 feet  $4\frac{1}{2}$  inches. Built in 1874 by the Iron City Bridge Works, of Philadelphia, Pa., over the Tymochtee river; 20 feet above water to rail.

Construction the same as No. 32 of the Eastern Division. Panels, 12. First main truss tie, two, 1 by 5 inches. First main strut, two, T-bars,  $2\frac{1}{2}$  by 5 by  $\frac{7}{16}$  inches thickness of metal. Floor beams, 8 by 14 inches, 3 to the panel. Stringers, 6 by 12 inches, lying flat. Ties, 6 by 7 inches on edge. Guard rails, 6 by 8 inches on edge, and 18 inches outside.

No. 98, an iron deck 1-span, 1-track truss, like a Post's Truss, with alternate inclined truss columns omitted, and corresponding ties; a peculiar structure. Span, 64 feet. Depth of truss,  $5\frac{3}{4}$  inches. Upper chord has 9 equal bays; lower chord has 6 equal bays, with a long one about double length at the middle, and a short one at each end, the latter 3 feet 8 inches each.

The first main strut made of a 6-inch I-beam, with a flange plate  $\frac{7}{8}$  by 6 inches, riveted upon the flanges of the I-beam. End post vertical, resting upon the bridge seat pedestal. Two ties start from the top of this post, one to end of the half bay and one to end of adjoining full bay: the 1st, two,  $1\frac{1}{2}$  by 3 inches, the 2nd,  $1\frac{1}{2}$ -inch round rod. Tie from top of 1st inclined column, two,  $1\frac{1}{2}$  by 3 inches.

Width of bridge between upper chords, 11 feet. Lateral ties, top,  $\frac{1}{2}$  by  $3\frac{1}{2}$  inches, bottom,  $1\frac{1}{2}$ -inch round. End sway braces,  $1\frac{1}{2}$ -inch rods. Upper chord of two 9-inch channel bars, with a cap and bottom plate, each  $\frac{1}{4}$  by 16 inches, riveted on, forming a box section. Floor beams,  $4\frac{1}{2}$  by 12-inch I-beams. Stringers, 9 by 18 inches, of a web and flange plates, with 4 angle bars in inside corners. Ties, 14 feet long, 6 by 7 inches on edge, and 8 inches between. Guard rail at end of ties, bolted and beveled. Over Blanchard creek, 24 feet water to rail; built in 1870.

No. 124, a wooden bridge, not stopped at. Apparently in bad condition. Timber for renewal on ground.

No. 148, a deck plate girder; 35 feet long and  $3\frac{1}{2}$  feet depth. Two tracks, and the girders so connected that the laterals extend across both bridges; ties, 1-inch rods. At the ends are two cross-stays. Section of upper chord at middle, about 14 square inches each outside girder. Floor beams, wood, 8 by 14 inches; 2 feet c. to c., bolted to chords. Stringers, 6 by 12 inches, flat. Ties, 6 by 8 inches, flat; 8 inches between. Guard rails, 6 by 8 inches, flat at end of 10 feet ties. Built in

No. 69, Pratt.

No. 76, double triangular truss.

No. 98, half post truss.

No. 124, wooden bridge.

No. 148, deck plate girder.

1876. Over lower branch of the Ottawa river; 20 feet water to rail. Abutments of good stone masonry.

No. 160, double triangular truss. No. 160, an iron double triangular truss, like No. 76 and No. 32 of the eastern division. By same company, in 1874. Length,  $54\frac{1}{2}$  feet. Depth, 7 feet. Width, 14 feet clear. Panels, 8. Floor beams of wood, one at each panel point, and one at each mid-panel point. Over Lost creek; 16 feet bed to rail.

No. 176, plate girder. No. 176, first span an iron through plate girder, 50.8 feet long; 6 feet depth, and 14 feet clear width. Flange plates, 12 inches wide. Angle bars,  $4\frac{1}{2}$  by 3 inches, and  $\frac{1}{2}$  inch thick. Section upper chord, at middle of bridge 17 square inches; one truss. To first vertical web stay, 26 inches from end. Then stays of angle bars, 2 by 3 inches. Iron cross-stays at ends, from girder to girder. Laterals,  $1\frac{1}{2}$ -inch round rods, with floor beams acting as struts. Stringers,  $4\frac{1}{2}$  by 15-inch I-beams, heavy. Three floor beams, iron, with web, 24 by  $7\frac{7}{8}$  inches, upon which is riveted the four 5-inch angle bars. An angle sway plate connecting floor beams and tops of trusses. Second span, 70 feet, by 6 feet depth of truss. Section of lower chord, at middle about 30 square inches. Vertical web stays, 25 feet. Laterals,  $1\frac{1}{2}$  inches at end; 5 floor beams to this span, made as above. Built in 1880. Over Hog creek; 15.8 feet bed to rail.

No. 177, plate girder. No. 177, a two track iron through plate girder. Span, 40 feet. Depth of truss, 3 feet 10 inches. Width, 15 feet c. to c. Section of the lower chord at middle, about 17 inches. Floor beams, sixteen, 10 by 12 inches, pine. Stringers, 6 by 12 inches, flat; 1874. Honey run.

No. 181, plate girder. No. 181, one span, a through plate girder of 64 feet span; 5.7 feet depth of truss, and 12 feet clear width. Section of upper chord at middle about 25 inches. Stays to web, 6 feet. Laterals,  $\frac{5}{8}$  by 4-inch bars. Beams, 10 by 20, of  $\frac{1}{2}$ -inch metal, plates and angle 4 bars. Stringers, an 18 by  $\frac{3}{4}$ -inch web, and four angle bars,  $3\frac{1}{2}$ . Pratt. Second span, a through Pratt iron truss of 100 feet span;  $22\frac{1}{2}$  feet depth of truss; built in 1880. Over Anglaize river. Panels, 7. End posts of two 11-inch channel bars, with flanges turned toward each other with a 14 by  $\frac{3}{4}$ -inch plate, riveted on outside. First truss columns of crimped iron flat bar, riveted between two 7 by  $\frac{5}{8}$ -inch flat bars, all 7 by  $8\frac{1}{2}$  inches. First main ties of truss, two, 5 by  $\frac{1}{2}$  inches. Lower chords at middle, two,  $\frac{7}{8}$  by 4 inches, and two, 1 by 4 inches. Pins,  $3\frac{3}{8}$  inches, steel. Floor beams, 10 by 26, and four 3-inch angle bars. Stringers, same as in east span. Laterals at end,  $1\frac{3}{4}$  inches at bottom. Top, smaller; a cross-stay between bed blocks, 5 by  $2\frac{1}{4}$ -inch I-beams. Guard rails, 8 by 8; notched and bolted. Built in 1880.

No. 182, culvert. No. 182, a culvert of 15 feet span, with two 15-inch I-beams, heavy;  $\frac{1}{2}$ -inch web, with lateral system in Howe truss style, wooden braces and iron tie rods.

No. 186, pile bridges. No. 186, a pile bridge, 2 spans; 5 piles to the bent. Caps, 12 by 13 inches, notched on pile heads. Stringers, two, 6 by 14 inches. Ties, 6 by 7, on edge, oak;  $1\frac{1}{2}$  feet long. Bearers, 6 by 14 inches. Guard rails, 6 by 7, at end of the 14 feet ties; notched and bolted every 5 or 6 feet.

No. 187, draw. No. 187, canal draw of peculiar design, with a sort of a "parallel rule" style of movement. Girders, four, 6 by 14-inch sticks, "boxed" or bound together into one girder beam of wood, with 13 filling pieces

within the length. Cross ties iron, with joints. Rails secured in iron chairs. A guyed gallows frame swings the girders, and raises them as they swing to open the draw. By this means they return by gravity. Span, 26 feet.

No. 194, a plate through girder of 43 feet span; 3.8 inches depth. Over Little Auglaize river; 16 feet bed to rail; 1871. Section of upper chord, at middle about 20 inches. Width, 13 inches, c. to c. The two trusses cross-stayed by  $1\frac{1}{4}$  by 4-inch bars, with forked ends, and bolted to the girder webs. Lateral rods,  $\frac{3}{4}$ -inch, or  $\frac{1}{2}$ -inch round. Floor beams rest on bottom flanges,  $6\frac{1}{2}$  by 14 inches. Ties, 6 by 7 on edge, and 13 feet long. Stringers, 6 by 7, flat. No. 194, plate girder.

No. 198, a deck iron plate girder of 24 feet span. Made at Fort Wayne, in 1878. Over Dog creek. Section of upper chord, at mid-span about 15 inches. Lateral and sway ties,  $\frac{1}{2}$  by 3, riveted on the girders. Admirable design for a bridge of this size. Flooring, standard. No. 198, deck plate girder.

Nos. 201 and 202, low wood structures.

No. 204, a through plate girder of 40 feet span, and 3 feet 8 inches depth. Over Town creek; 13 feet bed to rail; built in 1871. Construction similar to No. 194, as to laterals, etc. Section at middle of top chord about 18 inches. Lower, about 14 inches. Ties, 6 by 7, on edge. All flooring standard. Nos. 201 and 202.  
No. 204, through plate girder.

No. 207, a through iron plate girder of 58 feet span, and 6 feet depth. Over Muddy creek. Built in 1878. Made like No. 10, east division. Flooring, standard. No. 207, through plate girder.

No. 209, a short wooden bridge or culvert.

No. 219, a through plate girder of iron, of 30 feet span, and 3 feet depth. Over a ditch. Made in 1878. 3 floor beams, built of  $\frac{3}{8}$  by 16-inch web, and 3 by  $\frac{1}{2}$ , and 4 by  $\frac{1}{2}$ -inch angle bars. Stringers of  $4\frac{1}{2}$  by 11-inch I-beams. Laterals,  $\frac{1}{2}$  by 3-inch bars. Web stays, nine, first 18 inches, from end of girder. Flooring standard. Section at mid-span of the upper chord, about 14 inches; lower, about 15 inches. No. 209.  
No. 219, plate girder.

#### GENERAL STATEMENTS.

The track of the western portion of the E. & W. Divisions above is much straighter than the eastern, the country being more flat. The standard number of ties per mile is given as 2,800. Standard tie has 8 inches face for the rail seat. Distance between ties when laid, stated to be 15 inches. The standard joint is the suspension joint, at a space between ties of 10 inches, the joint ties being placed closer than others. Joints opposite or alternate without adhering to either. The standard weight of rail is 60 lbs. per yard, except on curves at heavy grades on the E. Division, where, when renewed, the rails are now made 67 lbs. per yard. In examining various portions of track, it is found to have "low joints" to a slight degree, whether alternate or opposite, but not to be noticeable in riding over the road. Ties.

The standard rail has a head slightly convex to radius of 10 inches at the top, and rounded at the top corners to a radius of  $\frac{1}{2}$  inch. The sides slope from a width of  $2\frac{3}{8}$  inches at a distance down of .46 inch to a width of  $2\frac{3}{4}$  inches at a distance down from crown of 1 inch. The under sides of the head are inclined at an angle of 12 degrees with the horizontal. The outer lower corners are rounded to a radius of  $\frac{1}{4}$  inch, Rail.

and inner corners next to the stem with a fillet to radius of  $\frac{5}{16}$ -inch. Distance from crown of rail head to intersection of the lines of the inclined undersides,  $1\frac{3}{4}$  inches. The stem is concave to a radius of 12 inches, and  $\frac{1}{2}$  inch thick at the thinnest point, the middle. Fillet between stem and foot to a  $\frac{5}{16}$ -inch radius. Inclination of the top surfaces of foot 12 degrees. Edges of foot nearly a semicircle to a radius of  $\frac{1}{8}$  inch. Width of foot,  $4\frac{1}{8}$  inches. Total height of rail,  $4\frac{1}{4}$  inches. Weight per yard, 60 pounds; per mile,  $105\frac{1}{2}\%$  net tons, steel.

Elevation of  
outer rail.

The elevation of outer rail on curves is stated to be  $\frac{3}{4}$ -inch per degree of curvature for the Eastern Division. For the Western Division it is stated at  $2\frac{1}{2}$  inches for a 5-degree curve, or  $\frac{1}{2}$ -inch per degree of curvature. On the last named division, it is held that the elevation should be made moderate, and that it is liable to be too great. It should not be so high that the train will wander from side to side across the clearance between wheel flanges and rails, as it is likely to do if made just to the theoretical value. It is preferred to keep the flanges pressing outward against the outside rails slightly, thus keeping the train steady, and also confining the principal part of the wear to the outside rail, and on the side of the head. Then the outside rails, after considerable wear, are put to the lower side, and the lower ones to the higher side of curve, thus wearing all the rails on both sides.

The life of ties is stated to be increased by use of stone ballast. For instance, in ordinary ballast it is found to average 6 years. From four years' experience on stone ballast it is estimated to be 8 or 10 years, an increase of about 50 per cent.

Locomotives.

The heaviest locomotives are stated to weigh 50 gross tons, or 112,000 pounds, when charged and on track ready for service. Length, point of pilot to buffer, 56 feet. A passenger coach weighs about 23 tons, and carries about 50 passengers. By actual measurement, the length of an ordinary coach is  $56\frac{1}{2}$  feet, average of 3 cars; a Pullman car,  $61\frac{1}{2}$  feet, one car; a baggage car,  $46\frac{1}{2}$  feet, 3 cars averaged; a U. S. postal car,  $56\frac{1}{2}$  feet. These lengths are from buffer to buffer. An engine, 51 feet, drivers 60 inches in diameter. The standard steam pressure carried on locomotives is 130 pounds per square-inch.

On this road water buckets are carried under the car seats, two cases to a car, each holding 3 or 4 buckets.

Sidings.

The sidings of this road are very long, often two miles, this length being necessary to facilitate the traveling of trains. They are probably in a measure prospective of a double track.

Ballast.

A large proportion of the track of these divisions is ballasted with stone. A stretch of about 70 miles between Crestline and Lima is remarkable for its uniformly good qualities. This is illustrated and described with some detail at Fig. 2 of "Railroad Economics," on another page of this report.

Cattle guards.

The cattle guards of this road are simple, efficient and durable. One feature worthy of note, is the bedding of the pit with about a foot depth of stone. The pit is drained when possible. See Fig. 3 of "Economics," on another page of this report.

General condition of  
bridges.

The bridges of this line were found in excellent condition, by far the greater proportion being iron, with good stone masonry foundations. The majority of these are of the plate girder type, and the road is pecu-

liar in the exceptionally large number of fine ones, the longest on the line in the State being 74 feet

Lightning protectors are placed on 2 or 3 poles in towns near offices. Lightning protectors.

2. The Cleveland & Pittsburgh Railroad, from Cleveland via Steubenville to Bellaire.

a. The Main Line—Cleveland via Bayard to Linton; inspected August 23rd and 24th, 1881.

No. 1, near Cleveland, a through Howe covered, wood. Span, 30 feet. Over a road. Built in 1868. Apparently standing well, and believed safe, though the intention is to remove it by filling as soon as possible. The road under is abandoned and out of use; it is already fenced and banked up, but people object to the filling. It is however thought that within a year or two public opinion will not interfere with the filling. No. 1, through Howe.

No. 2, a Howe through truss, covered. Span, 44 feet. Panels, 7. Chords, 4, 8, 4 by 10 inches. Depth of truss,  $6\frac{1}{2}$  feet. End main tie rods about,  $1\frac{1}{2}$  inches. Laterals, 6 by 6 and  $1\frac{1}{8}$  inches. Stringers, 10 by 12 inches, flat. Floor beams, 6 by 15 inches, 16 of them to the truss. Ties, 28 to bridge, 8 by 2-inch section. No guard rail, wood or iron. Ties rather poor, and the flooring should be renewed early. Built in 1869, over Mill creek; stone abutments. No. 2, Howe.

No. 3, exactly like No. 2 in construction and condition. Abutment No. 3. of west end crumbling at one side, where a 2nd track would be, but not affecting the safety of this. Built in 1869, over Mill creek.

No. 4, an iron plate girder of 50 feet span, and depth, 5 feet. Upper flange plate, 12 by  $\frac{1}{2}$  inches. Lower, 14 by  $\frac{1}{2}$  inches, put in 1879. No. 4, plate girder.

Floor beams, 8 by 24 inches, built in iron. Iron stringers. Ties, 8 by 8 inches, and 12 inches apart. Wood guard rail, 6 by 8 inches, lying flat, notched and bolted, at 18 inches out from the rails. Also iron guard rails inside. Abutments of good stone masonry. A good sound structure.

No. 8, a stone viaduct of 4 arches, each span 49.8 feet. All laid up in tooled stone with chipped edges; 1864; Tinker's stream. No. 8, arch.

No. 9, a through wood Howe Truss of 15-foot span, over Indian Run. Built in 1870. Truss, 3 feet deep in the clear. No. 9, Howe.

Floor beams, 8 by 12 inches. Stringers, 10 by 12 inches, flat. Ties like those on Nos. 2 and 3. Laterals, 6 by 6 inches, and  $1\frac{1}{8}$ -inch rods at bottom. Lower chord, 4, 7, 4 by 11 inches. Main truss rods,  $1\frac{1}{2}$  inches.

No. 10, a through Howe of wood, 7 years old. Span,  $33\frac{1}{2}$  feet. Depth, 3 feet 3 inches. Top chord, 8 by 17 inches solid. Lower, 10 by 18 inches solid. First main brace, two, 5 by 6 inches. First main tie, two,  $1\frac{1}{8}$  inches. One floor beam per panel, each 6 by 15 inches. Abutments stone. No. 10, thro'gh Howe.

No. 13, a through Howe Truss, covered. Span, 125 feet. Depth, 23 feet over all. 9 years old. Over the Cuyahoga river. No. 13, thro'gh Howe.

Main ties, two, 2-inch rods, and one,  $1\frac{1}{2}$ -inch rod. Braces, three, 9 by 10 inches, end. Next two,  $8\frac{1}{2}$  by 10 inches. Two independent arches of pine wood, 8 by 20 inches, in section to each truss, spring from the abutments, 8 feet below bridge seats, and rise at midspan to the lower side of the top chords. The arches are covered below the bridge.



Panels, 10. Chords, lower, 6,  $7\frac{1}{2}$ ,  $7\frac{1}{2}$ , 6 by 14 inches. One piece spliced at each panel with wood clamps, latter made very long for strength. Laterals, 6 by 6 inches, and  $1\frac{1}{8}$ -inch rods top and bottom. Floor beams, 6 by 15 inches, with 5 to each panel. Stringers, 10 by 12 inches, lying flat. Ties, 4 by 8 inches, lying flat, and 12 inches c. to c. Wood guard rail, 16 or 18 inches outside, bolted and spiked, not notched. Iron guard rail inside at approaches, but not through whole bridge. Clear width of bridge, 14 feet. Good stone abutments. This bridge covering has small doors, secured with locks. These are only for the road inspector, and covering so arranged that a person can go along inside over the whole length of trusses to examine it. Located near Earlville, east.

Nos. 14\* to 20.

Nos. 14 to 20, inclusive, stone arches, single track and span, about 10 to 20 feet span, except No. 16, which is 42 feet clear span.

No. 21, Howe.

No. 21, a through Howe, with covered trusses, wood. Span, 36 feet. Depth about 8 feet. Panels, 8. Chords with no splices, 4, 7, 4 by 10 inches. First main tie rods, two,  $1\frac{1}{8}$  inches. Laterals, 6 by 5 inches, and 1-inch rods, bottom. Good stone masonry abutments. Floor beams, 6 by 15 inches. Stringers, 10 by 12 inches. Bearers, 6 by 9 inches. Ties, 4 by 8 inches, with 4 inches between. Wood guard rail, 5 by 8 inches, bolted every 5 or 8 ties. Iron guard rail entirely over. Over Han's Run; 1870.

No. 22, plate girder.

No. 22, an iron plate girder, 55 feet in length. Depth of girders, 5 feet. Flanges, plates at end,  $\frac{1}{2}$  by 12 inches, middle, 1 by 12 inches. Section of top and bottom chords at middle, 20 inches. Angle bars between flanges and web, 4 by 4 inches, and  $\frac{3}{16}$ -inch thick. Vertical web stays, 11 in all, the first one being 18 inches from the end of girder, of angle bar, 3 by  $\frac{1}{2}$  inches. The top flange returns by a quarter circle over the top end corner, and extends down to meet the lower flange. Floor beams, 4 to the bridge, made of a  $\frac{7}{16}$ -inch web and 4 angle bars, at the ends. Middle portions probably re-enforced by flange plates. Between the ends of the floor beams, top flange and middle web, are angle plates or sway plates to prevent side deflection of top chord. This angle plate is 15 inches wide at the bottom, and about 6 inches at the top flange. Stringers of 4 by 15-inch I-beams;  $\frac{1}{2}$ -inch webs. Laterals of angle bar, 2 by 4 inches, and about  $\frac{1}{2}$ -inch thick. Ties, 7 by 8 inches, 14 inches between. Wood guard rail, 8 by 8 inches, and  $17\frac{1}{2}$  inches outside, bolted every 4 or 5 ties. Stone masonry abutments, all sound. Over Hahn's creek. Built in 1880.

Across the very ends of structure are connectors or stays of channel bar,  $2\frac{1}{2}$  by 10 inches, and 7 inches above the pedestal plate. This structure is the same in design as No. 10 of the Eastern Division of the P., Ft. W. & C. R. R.

No. 23, Howe.

No. 23, same as No. 26, covered wooden Howe Truss. Span, 50 feet. Same as No. 21, except in length. Built in 1869.

No. 24.

No. 24, same as No. 25. Span, 50 feet. Built in 1873. Not covered.

No. 25, Howe.

No. 25, a wood Howe Truss, not covered. Span, 50 feet. Depth, 9 feet 3 inches inside of chords. Same as No. 26. Lower chord,  $4\frac{1}{2}$ , 7,  $4\frac{1}{2}$  by 11 inches, spliced in middle piece, with 2 clamps at middle panel. Braces, 6 by 6 inches. Counters, 5 by 5 inches. Main tie rods,  $1\frac{1}{2}$  inches in diameter at end of truss. Upper chord, 9 inches deep. Panels, 8. Laterals, 6 by 6 inches, and  $1\frac{1}{8}$ -inch rod. Floor beams, 6 by 7 by 12 inches, 2 or 3 per panel. Bearers under ends of ties and under wood



guard rail of 5 by 8-inch oak. Bolts through guard and floor beams, every 6 or 8 ties. Ties, 4 by 8 inches, and 4 inches between. Iron guard rail 10 feet on bridge. Over Hahn's Run, built in 1873.

No. 26, a wood Howe Truss, with trusses covered. Lower chord, 4½, No. 26, Howe. 7, 4½ by 11 inches, spliced at three points, the middle piece at middle panel. Panels, 8. Total depth, 9 feet. Span, 51 feet. Wall plates about 5 by 15 inches. Laterals, 5 by 5 inches, and 1½-inch rods. Main ties, 1½ inches, at end of trusses. Floor beams, 6 by 15 inches. Ties, 4 by 8 inches, by 4 inches between, oak, with guard rails; 4 by 8 inches. Over Hahn's Run; built in 1869.

No. 27, an iron plate girder, 65 feet long, over Sandy creek; built in 1881. Made like No. 22. Iron guard rail, 10 feet in upon bridge at each end. No. 27, plate girder.

No. 28, a wood Howe with covered trusses, over Sandy creek; built in 1869. Span, 59 feet. Panels, 10. Total height of truss, 9½ feet. Lower chord, 5, 8, 5 by 11 inches, with middle piece spliced at 2d panel from each end. Small pieces spliced at 1½ panels from middle. Main ties, 1½-inch rods, at end of truss. Laterals, 6 by 6 inches, and 1½-inch rods at bottom of truss. Floor beams, 6 by 15 inches, two to each panel. Stringers, 10 by 12 inches. Ties, 2 by 8 inches, and 4 to the panel. Two floor beams rotted too much. Good stone abutments. No. 28, Howe.

No. 29, same exactly in length, floor beams, etc., as No. 28. No. 29, Howe.

No. 30, iron plate girder like No. 22 and others, built in 1881, over Brush Run. Iron guard rail over the entire bridge. No. 30, Howe.

No. 31, a wood stringer girder over a road. No. 31, wood girder.

No. 35, iron plate girder like No. 22 and others in design. Iron guard rail over entire bridge. No. 35.

No. 36, an iron plate girder, built in 1878, over Yellow creek. Three tracks. One span of 55.2 feet. Four girders, 2 outside ones 6 feet, and 2 inside ones 7 feet depth. Same in design as No. 22, and as No. 10 of the Eastern Division of the P., Ft. W. & C. R. R. Floor beams, 5 to the span, 19 inches deep, with webs 6½ by ½ inches. Stringers, iron, 15 inches deep. Ties, 6 by 8 inches, and 4 inches between. Wheel guard, 6 by 8 inches, bolted, and 8 or 10 inches outside. Iron guard rails over all. No. 36, plate girder.

No. 37, a wood 2-span through Howe, with trusses covered. Panels, 8. Depth, 9 feet. Chords, 4, 7, 4 by 11 inches. Top, 9 inches deep. Middle piece of lower chord spliced near middle panel. Side pieces spliced 2 panels from this, with clamps having parallel claws. Main ties of truss, 1½-inch rods. Braces, 6 by 6 inches. No wood wheel guards. Spans, 51 feet each. Over the North Fork of Yellow creek. Built in 1872. No. 37, through Howe.

Nos. 38 and 39, being renewed with an iron plate girder. Over Yellow creek. No. 38, plate girder.

No. 41, a wood Howe Truss of 50 feet span, 7½ feet depth clear. Built in 1872. Not covered. Chords, 4, 7, 4 by 11 inches, spliced. Braces, 6 by 6 inches. Main ties, two, 1½-inch rods. Laterals, 6 by 6 inches, and 1½-inch rods. Floor beams, 6 by 15 inches, 2 to the panel. Stringers, 10 by 12 inches. Ties, 2 by 8 inches, about 2 inches apart. Ties irregular in distribution; not sufficiently secured. No wheel guards. Over Yellow creek. No. 41.

No. 42, being rebuilt in an iron plate girder. Over Yellow creek. No. 42, plate girder.

- No. 43, plate girder. No. 43, an iron plate girder like No. 22 and others. Track curved. Over a mill-race.
- No. 47, Howe Truss. No. 47, a wood Howe Truss, 2 spans of 50 feet each. New chords put in 4 years ago. Length of bridge, 112 feet. Depth of truss, 9 feet total. Truss tie rods, two,  $1\frac{1}{2}$  inches at end of bridge. Braces, 6 by 6 inches. Counters, 5 by 6 inches. Floor beams, 6 by 15 inches. Stringers about 10 by 12 and 14 by 12 inches, for elevation of outer rail for the curved track on bridge. Ties, 4 by 8 inches, lying flat. Wheel guards, 4 by 8 inches, pine, spiked and bolted every 6 feet. Bearers under ends of 14 feet ties. Iron guard rails, about 10 feet on bridge and 20 feet on bank approach at each end of bridge. Width of bridge, 14 feet. Over Yellow creek, north fork.
- No. 48, plate girder. No. 48, an iron plate girder, built in 1881, over Yellow creek, north fork. Wheel guards, 6 or 8 by 8 inches. Track curved. No iron guard rails.
- No. 49, plate girder. No. 49, iron plate girder, same as Nos. 27 and 22 in design. No iron guard rail. Track curved. Length of bridge, 128 feet. Two spans of 60 feet each. Over north fork of Yellow creek. Built in 1880.
- Nos. 50, 51, 52. Nos. 50, 51 and 52, to be renewed in iron immediately.
- No. 53, plate girder. No. 53, an iron plate girder of 2 spans, of 60 feet each. Over the north fork of Yellow creek. Track curved. Built in 1880. Floor apparently as others. Guard rail, 10 feet on bridge and 20 feet on bank.
- No. 54, plate girder. No. 54, a 2-span iron plate girder of 60 feet span each. Over the north fork of Yellow creek. Ties, 8 by 8 inches. Wheel guard, 7 by 8 or 8 by 8 inches. Iron guard rail as in No. 53.
- No. 55, Howe through truss. No. 55, a wood Howe through truss, with trusses covered when built in 1875. Panels, 12. Span, 130 feet. Built much as Nos. 13 and 109. Lower chord, 6,  $7\frac{1}{2}$ ,  $7\frac{1}{2}$ , 6 by 14 inches. Floor beams, 4 to the panel, 6 by 15 inches. Ties, 4 by 8 inches, 2 inches between. Wheel guards, 4 by 8 inches, oak, about 16 inches outside, and bolted by bolts about 6 inches apart. Ties, 14 feet long. Over Big Yellow creek.
- No. 56, Pratt truss. No. 56, an iron Pratt double system truss. Span, 150 feet. Length, 157 feet. Over Big Yellow creek. Built by the Keystone Bridge Company, in 1871. End posts, Keystone column, inclined. Depth of truss,  $21\frac{1}{2}$  feet. Top chord of 2 channel bars, outside 3 I-beams, and a cap plate over all. Lower chord at middle two,  $5\frac{1}{2}$  by  $1\frac{1}{2}$ . Next panel, two, 5 by  $1\frac{1}{2}$  inches. Main tie rods at end two,  $2\frac{1}{2}$  by  $1\frac{1}{2}$ . Next two,  $2\frac{1}{2}$  by  $1\frac{1}{2}$ . These both start from top of end post, and extend to points in lower chord, 1 panel apart. Laterals,  $1\frac{3}{8}$ -inch rods, with Keystone columns. Floor beams, wood, 8 by 14 inches; 4 to the panel. Stringers, 8 by 14, lying flat. Ties, 4 by 8 inches, flat, 6 inches between. Wheel guard, 16 inches outside. Iron guard rails over bridge, and 30 feet on banks. One of these extended 100 feet beyond, and single. Pins,  $3\frac{1}{2}$  inches at ends, and others nearly the same.

b. The River Division—Bellaire via Linton to Wellsville.

Numbers of structures reckon from Bellaire.

- No. 62, an iron Howe. No. 62, near Bellaire; an iron Howe through truss. Span, 102 feet. Length, 110 feet. Depth of truss,  $20\frac{1}{2}$  feet. A very peculiar structure for iron. All compression members of the trusses are of cast iron, and all tension members of wrought iron. The upper chord end posts and braces are cast iron, nearly cylindric tubes, slightly bellied; the braces

being 5 inches in outside diameter at the ends, and  $5\frac{1}{2}$  inches at the middle. On opposite sides of these tubular braces, and in the plane of the trusses are strengthening ribs,  $\frac{1}{2}$ -inch thick,  $1\frac{1}{2}$  inches wide in the radius, and about two to three feet long; two to each brace. The thickness of these tubes is uncertain. A small aperture in one of them at 6 or 8 feet from its end, and about at the quarter span, enabled the thickness at that particular point to be measured, which was eleven-sixteenths of an inch. The braces and counter braces are bolted together at their common intersection points.

At the intersection points of chords and braces are angle blocks or boxes, which are carefully turned off in a lathe to cylindric surfaces where the braces are seated upon them. These cylindric surfaces run crosswise with respect to the braces, and also with respect to the plane of the truss. The braces are fitted to these cylindric surfaces by their ends being dressed to hollow cylindric form crosswise. This fitting enables the braces to seat themselves in position, free from cross-strains. There are two braces and a counter-brace between, as usually arranged in wooden Howe bridges. The main truss rods are vertical, the first set, i. e., that running to the top of the end set of braces, is three,  $1\frac{1}{8}$  inches. Next set, three,  $1\frac{3}{8}$  inches.

The lower chord at middle is composed of four  $\frac{3}{4}$  by 5-inch bars of wrought iron; next to middle panel, four,  $\frac{3}{4}$  by 5 inches; at end of truss, four,  $\frac{1}{2}$  by 5 inches; next, four,  $\frac{3}{8}$  by 5 inches. These bars are locked directly upon each other within the angle boxes by lock heads, welded or forged upon the sides of the ends of the bars. In consequence of the lock, the chord bars, as seen in horizontal projection, offset each other by the amount of the lock shoulder. These heads are slightly rounded on the shoulders, so that the bars can turn on each other a trifle. The angle boxes, according to drawings presented, receive these locked bar heads in hollow spaces with close fits, thus not only preventing the heads from slipping off each other, but destroying the tendency to bend back. Thus the full strength of the bars is secured even with side locks. The angle boxes are in two parts joined at the mid-depth of the chord bars. The main truss rods go vertically through the angle boxes. The lateral diagonal ties are secured to lugs cast on the underside of the angle boxes; rods,  $1\frac{1}{8}$  inches, top and bottom. Cast iron struts above.

The floor beams are pine, 4 to the panel, and rest upon the lower chord. They are in pairs, each pair, two, 7 by 14 inch pieces, resting on cast plates, each made to receive the ends of two beams. The middles of these double-seat plates are located at  $22\frac{1}{2}$  inches from the middles of the angle boxes. Angle boxes, 9 inches broad. Side of angle boxes to middle of seat-plates, 18 inches. Side to side, angle box to seat-plate, 10 inches. Bolts secure beams upon seats, by one bolt through each beam, to a  $\frac{3}{4}$  by 3-inch iron strap. The floor beams are trussed, each couplet with truss rods, the upper end corners running down to a depth below the lower sides of beams of 20 inches.

Stringers, 12 by 14 inches. Side bearers, 8 by 14 inches. Ties, 4 by 6 inches, 2 inches between. Iron guard rails inside, from 10 feet on bridge to 50 or 75 feet on bank at each end.

Total length of bridge, 110 feet. Span, 102 feet. Depth of truss, 20½ feet. Panels, 8. Built by the Cleveland Bridge Co. in 1867. Over Indian creek, located near Bridgeport,  $\frac{1}{10}$  mile west.

The lower chords of this bridge appear, from calculation, to be weak for the present arrangement by which they carry the floor beams, and for the present train weights. Assuming the floor beam loads as active at the middle points between in the couplets, or at 18 inches from the sides of the angle boxes; the maximum strain in the lower chords appears to be over 20,000 lbs. per square inch. See last example in appendix to this report on *Beams and Columns*.

No. 63, plate girder.

No. 63, an iron deck plate girder, 29 feet long; depth, 2 feet; upper flange,  $\frac{3}{4}$  by 10 inches at middle; angle bars between flange and web, 3 by 4 inches, and  $\frac{1}{2}$  inch thick; stays, seven, of angle bar, 3 by 3 inches, by  $\frac{3}{8}$ -inch thick; laterals of angle bar, 2 by 3½ inches, by  $\frac{3}{8}$ -inch; sway braces,  $\frac{3}{8}$  by 3 inches, cross diagonally in the cross section from top to bottom flanges, with angle bar struts, chord to chord, top and bottom. Ties, 8 by 8 inches, 6 inches between. Wheel guards, 8 by 8 inches.

Nos. 64 and 65.

Nos. 64 and 65, in sidings for freight.

Track in this locality rather dusty.

No. 73, iron lattice.

No. 73, iron lattice structure. Too short; water way too small. Badly washed recently. An iron plate girder going in soon.

No. 77, Howe.

No. 77, a wood through Howe truss. Built in 1870. About the same as Nos. 13 and 109, except timbers and rods, rather better. Panels, 12; floor beams, 6 by 15 inches; stringers, 10 by 12 inches; ties, 2 by 8 inches, and 20 to 24 inches apart. No wheel guards. Bearers, 6 by 15 inches; span, 144 feet; length, 155 feet; depth of truss, 24 feet, total. Over Short creek. East of Portland.

No. 85, Howe.

No. 85, a wood through Howe, not covered; span, 50 feet; depth of truss, 7 feet 5 inches clear; panels, 10; braces, 6 by 7½ inches; counters, 5 by 6 inches; main truss rods, two, 1½ inches; lower chords, 5, 8, 5 by 11 inches; top, 9 inches deep; floor beams, 6 by 15 inches, 2 to the panel; stringers, 10 by 12 inches; ties, 2 by 8 inches, about 20 or 24 inches apart. No wheel guards, nor guard rails. Top chords look old from action of the weather. Built in 1872. Over Riddle's Run.

No. 92, Pratt.

No. 92, an iron Pratt truss, of 124 feet span, and 132 feet length. Over Cross creek. Built in 1878. About  $\frac{1}{2}$  mile west of Mingo Junction.

Lower chords at middle, four, 1 by 5 inches, and two  $\frac{3}{4}$  by 5 inches. Second main truss ties from end of truss, two, 1½ by 4 inches. Panels, 9. End post of two 12-inch channel bars, capped by a  $\frac{9}{16}$  by 12-inch plate.

Floor beams, 22 inches deep, iron; stringers, 7 by 15 inches; ties, 6 by 8 inches, and 14 or 16 inches between; wheel guard, 6 by 8 inches, bolted as others, 16 or 18 inches out; width, 14 feet clear. Ties uneven; wheel guards should be notched on. Abutments of stone masonry.

No. 95, wood Howe truss.

No. 95, a wood Howe truss; 68 feet long; at North Steubenville. Built in 1874. Depth of truss, 7 feet 2 inches clear; main braces, 6 by 7 inches; end truss ties, two, 1½ inches; chords, 5, 8, 5 by 11 inches. Center piece spliced near ends, and side pieces near middle.

Floor beams, 6 by 15 inches; stringers, 10 by 12 inches; bearers, 6 by 10 inches; ties, 4 by 8 inches, oak, 4 inches between; wheel guards, 5 by 8 inches, oak, 18 inches out, bolted each 4 feet; laterals, 6 by 6

inches, and 1½-inch rods. Wall plates or blocks poor; new ones already ordered.

No. 109, a wood Howe deck truss of 14 panels, 150 feet span, and 21 feet depth of truss. Built in 1871. Over Big Yellow creek. Full covered. No. 109, wood  
Howe deck.

Lower chords, 6, 7½, 7½, 6 by 14 inches. Braces, at end, three, 9 by 10 inches. End truss rods, two, 2 inches, and one, 1½ inches. Sway braces in 12 sets, 6 by 8 inches, seated upon cast iron angle blocks. Laterals, top and bottom, 6 by 6 inches, and 1½ inches. Trusses supported by independent arches, springing from good stone masonry abutments 8 feet below, and rise to bottom of top chord. Suspending rods from arches to lower chords, 1½ inches diameter.

Floor beams, 6 by 15 inches. Stringers, 10 by 12. Ties consist first of two 1-inch board covering for roof, and second of 1 by 7-inch oak strips, laid on 2 feet apart. The trusses of this bridge about the same as those for Nos. 13, 55 and 77. East approach 2 stone arches, 19 and 39 feet, respectively. West approach a single stone arch, 39 feet.

No. 110, a Howe truss of wood; 54 feet span. Built in 1876. Depth, No. 110, Howe. 7 feet 5 inches. Over Second street, Wellsville. 8 panels. Braces, 6 by 6. End truss rods, two, 1½ inches. Chords, 4, 7, 4 by 11. Trusses not covered. Floor beams, 6 by 15; two to panel. Stringers, 10 by 12 inches, lying flat. Ties, 2 by 8 inches, and about 2 feet apart. Laterals, 6 by 6 and 1½-inch rods. Stringers, old and partially decayed. Will probably be renewed soon. Chords hold up well to the work.

c. The Tuscarawas Branch—Bayard to New Philadelphia.

Tuscarawas  
Branch.

The number of structures reckon from Bayard Junction west.

No. 128, near Bayard, about one-third mile west. A through Howe truss; not covered. Span, 35½ feet. 6 panels. Depth of truss, 7 feet 5 inches clear. Built in 1873. Over Sandy creek. Braces, 6 by 6. Truss rods, two, 1½. Floor beams, 6 by 15; 2 to the panel. Stringers, 10 by 12, flat, notched 1-inch on the beams. Ties, 2 by 8 inches; 2 feet between. No bearers, nor wheel guards. No. 128, Howe.

No. 129, a Howe truss, covered; built in 1867. Span, 78 feet. Over Sandy creek. Lower chords, 5, 6½, 6½, 5 by 14. End truss ties, two, 1½ or 1½ inches. Braces, about 8½ by 9 inches. Laterals, 6 by 5 inches, and 1½ rods. Floor beams, 6 by 12 inches. Stringers, 10 by 12 inches, flat. Bearers, 8 by 9. Ties, 4 by 8 inches, oak; 14 feet long; 2 inches between. Wheel guards, 4 by 8 inches; 16 inches outside, over bearers, and bolted every 6 or 7 ties. Iron guard rails on approaches, and enter 10 feet on bridge. Top laterals are of 5 by 5 braces, and oak ties 6 by 6, locked on chords by notches. Depth of truss, 22 feet total. Abutments of good stone masonry. Clamps and keys every panel, all standing up well. No. 129, Howe.

No. 130, a 10-bent trestle, 96 feet long. Trestle frames of mud-sills, 2 batter posts and cap, all 12 by 12 inches, and sway braces 2 by 12; stayed longitudinally by 2 by 12-inch planks. Ties, 2 by 8 inches, about 20 inches c. to c.; new. No. 130, trestle.

No. 131, temporary works; How truss going up. Over Sandy creek.

No. 132, a Howe truss; not covered, but painted. 8 panels. Span, 28 feet. Over Sandy creek. Flooring like that on No. 133. Built in 1877. No. 132, Howe.

- No. 133, Howe.** No. 133, a Howe through; not covered, but painted. Length, 32 feet. Depth, 5 feet 2 inches in the clear. Over Middle run. Built in 1877. Braces, 6 by 6. End truss ties, two,  $1\frac{1}{2}$  inches. Chords,  $4\frac{1}{2}$ , 7,  $4\frac{1}{2}$  by 11 inches. Top, 9 inches. Built with 1-inch spaces. Ties, close, 4 by 8 inches; 14 feet long. Wheel guards, pine, 18 inches outside, 4 by 8 inches, not notched, but spiked, and bolted every 4 or 6 ties. Stringers, 10 by 12.
- No. 137, stringer.** No. 137, stringer bridge; built in 1880. Over a mill run. Stringers, 12 by 19 inches; pine. Length, 29 feet. Span, 16 feet. Wheel guards, oak, beveled inside. Ties, 4 by 8 inches; oak. Bolts through wheel guard and stringers. One stringer under each rail, and one under each wheel guard.
- No. 139, Howe.** No. 139, a wood Howe truss of 20 feet span; 28 feet length. Built in 1880. Clear depth, 4 feet 6 inches. Over Plain run. Chords, 5, 8, 5 by 11 inches. Braces, 6 by  $7\frac{1}{4}$ . End truss rods, two,  $1\frac{1}{2}$ . Two floor beams of each of the 6 panels. Ties, 4 by 8, and otherwise standard.
- Tunnel.** A tunnel of 15 feet clear width, and  $16\frac{1}{2}$  feet total length to crown of the masonry semicircular arches. Side walls vertical, all stone. Arching stone for some distance at portals, and brick within. Length, 1010 feet.
- No. 141.** No. 141, a pine queen-post bridge of 12 by 12 main timbers. Depth, about 5 feet. Middle rectangle, braced with 6 by 12-inch sticks. Vertical tie rods, two,  $1\frac{1}{2}$  inches. Span,  $18\frac{1}{2}$  feet. Two suspended floor beams, each 12 by 15 inches. Stringers, 12 by 14. Flooring, standard. Built in 1879. Timber dressed. Stone abutments.
- No. 142, Howe.** No. 142, a wood through truss; well covered separately. 14 panels. Span, 149 feet. Built in 1873. Four independent arches of wood, made of five, 4 by 8 inches. Arches not covered. Truss chords,  $6\frac{1}{2}$ , 7, 7 and  $6\frac{1}{2}$  by 14 inches; all painted. Floor beams, new, 6 by 15 inches, with four to the panel. Ties, 4 by 5 inches, notched to  $3\frac{1}{2}$ -inch thickness on stringers. Side bearers, 6 by 9 inches. Laterals, 6 by 6 and  $1\frac{1}{4}$ . Iron guard rails at approaches. Good stone masonry abutments. Over Connotton creek.
- No. 143, through Howe.** No. 143, a through wood Howe truss bridge, covered; built in 1870. Span, 50 feet. Depth, 9 feet. Panels, 8. Chords,  $4\frac{1}{2}$ , 7 and  $4\frac{1}{2}$  by 11. The 7-inch piece spliced at middle panel. Side pieces spliced at second panel from middle. Splice clamps with straight locks, and  $1\frac{1}{4}$ -inch necks. Abutments good stone masonry. Bearers, 6 by 15 inches; 2 to a panel. Stringers, 10 by 12, flat. Ties, 2 by 8 inches; 36 to the bridge. End truss rods, two,  $1\frac{1}{2}$  or  $1\frac{3}{4}$ . Braces, 6 by 6. Laterals, 6 by 6, and  $1\frac{1}{2}$ -inch rods. Over Connotton creek.
- No. 146, Howe.** No. 146, Howe through truss, 2 spans, of 125 feet each, with 10 panels, 24 feet depth of truss, and 14 feet clear width. Built in 1879. Over the Tuscarawas river. End truss rods, three,  $2\frac{1}{2}$  inches. Other dimensions as in 147. Clamps very long, and in every panel after the first. Ties, 5 by 8 inches, oak. Otherwise flooring same as in 147. Laterals, 6 by 6, and  $1\frac{1}{2}$ -inch rods. None of above covered. Abutments T-walls in masonry.
- No. 147, Howe.** No. 147, a through Howe truss of wood, of 80 feet span; 24 feet total depth of truss; 14 feet width, clear. Over Ohio canal; built in 1880. Lower chords, 6,  $7\frac{1}{2}$ ,  $7\frac{1}{2}$ , 6 by 16 inches. Upper, 13 inches deep. End truss rods, three,  $2\frac{1}{2}$  inches, not upset for threads. Braces, three, 9



by 10 inches at end. Laterals, 6 by 6 inches, and 1½ inches top and bottom. Chord bolts, ¾ inch. Floor beams, 6 by 15; 5 per panel, spiked to chords. Stringers, 10 by 12, flat. Bearers, 6 by 10. Ties, oak, 4 by 8, flat. Wheel guard, 6 by 6, notched, and bolted every fifth tie through guard and bearer, and occasional floor beams. Clamps and keys painted. Clamps, 3 inches thick in head, and 1½ inches in necks, and about 8 feet total length. Clamps in every panel after the first. Abutments of stone masonry.

No. 148, a Howe through truss, over canal basin. Span, 50 feet. No. 148. Depth, 7½ feet clear. 8 panels. Width, 14 feet clear. Lower chord, 3½, 7, 3½ by 11 inches. At ends of trusses 4 vertical sticks make a hollow compound end post, 28 inches in length of truss. End truss rods, two, 1½ inches. Floor beams, two per panel, 6 by 15 inches. Ties, oak, 4 by 8 inches, notched ½-inch on 10 by 12-inch stringers. Wheel guards, 6 by 8 inches, oak, notched and bolted every 5 ties, at 16 inches out. Piers of piling, west one of 19 piles. East approach, a pile trestle on curve; spans about 10 feet. 18 bents. Piles and caps look old. Ties, 14 inches c. to c. Most of this trestle will be filled this fall. West approach, a framed trestling, composed of sills, caps and batter posts, 12 by 12 inches, and sway braces, 2 by 12 inches. Stringers, pine, 14 by 18 inches, on edge. Ties, 6 by 8 inches, 14 inches c. to c. Spans, 14 feet long, and no bolsters. 15 bents.

#### GENERAL REMARKS.

On the main line, rails are steel from Cleveland to below Steubenville, and next year will be to Bellaire. Standard rail, 60 pounds per yard.

The main line has about 34 miles of furnace slag ballast. River Division about 3 miles.

The standard cattle guard here requires a pit about 4 feet deep, by 8 feet breadth trackwise. In this is first laid a footing of stone, 2 by 2 feet, around a rectangle, about 5 feet 8 inches wide trackwise by about 12 feet crosswise of track. The end stones may be only 12 inches on top face. On this footing of stone, crossing rails, is placed each side a 12 by 12-inch stick, about 12 feet long. Across these, and resting on them, is placed under each rail a 12 by 12-inch stringer piece, about 10 or 12 feet long, overreaching the pit and side blocks.

The standard engine and tender of the C. & P. R. R. weighs 112,600 pounds. Length, point of pilot to drawbar, 50 feet. Standard engine.

Weight of a passenger car, 36,000 pounds. Length of body, 42 feet. Buffer to buffer, 51 feet 6 inches. Carries 48 persons. Freight car weight, 19,000 pounds. Freight car load, 20 tons. Freight car length, buffer to buffer, 33 feet 2 inches. Stock car length, 37 feet 8 inches for the new standard. Steam pressure, standard maximum, 130 pounds per square-inch; usual, 120 pounds.

Illuminating oil, "Mineral Seal," of 300° fire test. Use some candles, changing from candles to oil. Lamps for cars have brass bodies. Illuminating oil.

Standard number of ordinary ties per mile, 2,800, average. Virginia ties average about 10 inches wide. Minimum tamping space between two ties, 8 inches, as at a suspension joint of rails. Ties.

Spring frogs are not allowed in use.

Frogs.



3. The Northwestern Ohio Railroad, Toledo Junction to Toledo.  
Structures numbered from Toledo Junction north ; inspected  
August 26th, 1881.

- No. 1, trestle. No. 1, a trestle. This is soon to be renewed with  $2\frac{1}{2}$  spans of 16 feet each. Timber now on the ground.
- No. 2, trestle. No. 2, a 2-span trestle, sound and good. Flooring, standard.
- No. 3, string bridge. No. 3, a 5-span stringer bridge. Five stringer pieces to be put in new ; work ordered by Railroad Company. The bridge will then be all correct.
- Junction. Junction with C. C. C. & I. R. R.
- No. 4, pile bridge. No. 4, a pile bridge, being made new ; piles in, and timber on the ground.
- No. 5, pile bridge. No. 5, a pile bridge being made new, with piles already in.
- No. 6. No. 6, same condition as No. 5.
- No. 7. No. 7, length 32 feet, and another small, near by, new two years ago.
- Small structures. Several small openings, not numbered, and cattle guards being renewed.
- No. 8. No. 8, piles of former pile bridge sound at earth. These are cut off for support of mudsills of framed trestle bents. Two stringers, 3 caps and two trestle bents new this year. Flooring, standard.
- Ties. Ties in track along here are old and poor. New ones needed.
- No. 9. No. 9, to be filled, except one opening.
- No. 10, Howe. No. 10, a wood deck Howe Truss, uncovered. 1 track ; 1 span of 74 feet. Depth of truss,  $11\frac{1}{2}$  feet. Over Honey creek ; 29 feet rail to bottom. Width, 14 feet out to out.
- Lower chords, 4, 5, 5, 4 by 12 inches. Upper, 10 inches. End braces, 7 by 8 inches. End truss tie rods, two,  $1\frac{1}{8}$  inches. Floor beams, 7 by 12 inches, 3 to the panel. Stringers, 6 by 12 inches, raised on corbels, 5 inches deep, and extending 6 to 8 inches over sides of stringers. Ties, 5 by 8 inches, 5 inches between. Wheel guards, over bearers, 6 by 6 inches, 22 inches out, and bolted every 8 feet. Trestle supports already placed under the quarters.
- No. 11. No. 11, to be reduced to a 3-span of 45 feet length. To have 8 new string pieces ; middle bent to have new cap and 1 post ; next trestle south to have a new cap and two posts or piles ; new ties and wheel guard to be put into standard flooring ; to be done this year. This will then be all correct.
- No. 12, pile bridge. No. 12, a pile bridge. New stringers are already ordered by the company for this, also one mudsill and 4 caps. End trestles double at the north end. The bank plank against trestles are two-story. One mudsill is pushed partly off from the sub-sill. Wheel guards, 6 by 6 inches, pine, bolted every 5 feet, and notched on ties. The repairs will make this safe.
- No. 13, through Howe. No. 13, a through Howe uncovered truss bridge of 2 spans, 1 track, with continuous chords ; each span,  $104\frac{1}{2}$  feet. 10 panels. Depth of truss, 23 feet. Usual width. 25 feet rail to bottom. Structure old ; crosses the Sandusky river at Tiffin. Lower chords, 5, 6, 6, 5 by 14 inches. Clamps,  $1\frac{1}{2}$  inches at the necks, with long parallel heads. Two clamps to the joint for the middle pieces of the chord. Braces, 9 by  $10\frac{1}{2}$  inches. End truss rods, three,  $1\frac{1}{8}$  inches. Next three,  $1\frac{3}{4}$  inches. Floor beams, 7 by 16 inches, 4 to the panel. Laterals, 6 by 6 inches, and  $1\frac{1}{4}$ -

inch rods top and bottom. Stringers, 6 by 12 inches. Abutments, trestle frames.

The sap wood of the posts of this bridge is badly rotted, and looks bad. The section of the lower chords is estimated to be reduced by the sap rot from the original 14 inches depth, to 10 or 12 inches of effective wood, or a reduction of section of 12 to 20 per cent. By sounding the timbers with a boring bit, all examined were found sound at the heart. Made three borings at different points in the structure. The splice joints of the lower chord were holding well, indicating absence of dry or other rot at the heart.

The absolute safety of this bridge is regarded as doubtful, even with contemplated repairs completed. The nature of the stream beneath is not favorable for trestle supports. An early renewal of the bridge is believed desirable.

The south approach is a trestling over streets, 121 feet long. One new post is being added to each of the framed trestle bents.

The north approach is a small Howe truss, 49 feet long; 6 feet 2 inches depth, not covered. Lower chords, 5, 8½, 5 by 10 inches. End braces, 5 by 7. Counters, 6 by 6. End truss rods, two, 1½ inches. 8 panels.

Sap wood rotted. New posts being put into chords, and trestle bents being put under. Abutments trestle frames.

No. 13½, trestling over streets of Tiffin; two trestles in street, with No. 13½, trestle. five 12 by 12 posts, and crossing sway braces of stout planks. Light feeble trestle supports at edge of sidewalk and street. Stringers, two, 10 by 20, pine; 22 feet span; 3 spans. South span has 2 sets of stringers; second span 3 sets, and the third or north span has 4 sets of stringers. Tracks divide on this trestle bridge. Ties, 6 by 8 inches; 6 inches between. Guards, new, 7 by 8, bolted, each 3 or 4 feet, and notched. Safe Over Washington street.

No. 14, a 5-span trestle. Six string pieces, 4 caps, and one batter No. 14, trestle. post ordered by company for this, thus making the bridge safe at present. The deportment of the water way here is peculiar, according to statements of the road master. Occasionally large quantities of water, bringing much drift material, seek to pass at this opening. The drift is caught upon the piling, hindering the water and causing sudden wash of banks. A bridge with a clear opening, and stone abutments with wing walls would cure this. This opening is at a low point of grade, from both directions, and not near a station, so that trains usually pass at full speed, and often at excessive speed by reason of the down grade approaches. A raising of 2 or 3 feet of grade at this point seems therefore desirable, for securing the best condition. Over Wolf creek.

No. 15, shortened from a 31 feet to a 15 feet pile trestle, with stand- No. 15, trestle. ard flooring.

No. 16, a wood through uncovered Howe truss of 74 feet span; 22 No. 16, Howe truss. feet depth; 6 panels. Lower chords, 4, 5, 5, 4 by 12 inches. Braces, 8 by 8. End truss rods, two, 1¾ inches. Clamps and keys, pine. Splice at each panel, except perhaps the end ones. Six floor beams per panel. Ties standard. Wheel guards, 6 by 7 inches, on edge; notched and bolted. This bridge appears old; has sap rot. It is also light for the span. The splice joints of the lower chord give signs of drawing out; one or two have started to split off at the locks. Though the speed is

usually slow because near a station, yet it is believed that a trestle bent should be put under for support of the bridge.

No. 17. No. 17, stringers on piles. Each stringer, two, 7 by 16 inches; 2 spans. Flooring standard. New, and all good.

No. 18, pile bridge. No. 18, a 6-span pile bridge. Six caps and five stringers ordered on by company; making good and safe.

No. 19, pile bridge. No. 19, a pile bridge, 45 feet long, till recently filled to one or two spans; 2 caps and 3 stringers added, making this sound and good. Over Miller's creek.

No. 20, pile bridge. No. 20, pile bridge; stringers, 7 by 16 inches, 4 new stringers and 2 caps ordered; ties, 5 by 8 inches, and otherwise standard. Over Sugar creek.

No. 21, through Howe. No. 21, a through Howe; uncovered, 8 years old. Span, 150 feet; depth, 22 feet; panels, 12; lower chords,  $5\frac{1}{2}$ , 7, 7,  $5\frac{1}{2}$  by 14 inches; end braces, 10 by 12 inches; end truss rods not upset for threads, two,  $1\frac{3}{4}$  inches. Four independent arches of three 8 by 10-inch sticks, cut to curve, and spring from the abutment at 6 feet below lower chord. Abutments good stone masonry. Made by the Smith Bridge Co., of Toledo. Laterals, 6 by 6 inches, and  $1\frac{1}{2}$  inches top and bottom; floor beams, 6 by 14 inches, 6 to panel; stringers, 6 by 12 inches; ties, 7 by 8 inches, 10 inches between, oak; guards, 4 by 5 inches, oak, notched and bolted every 3 or 4 feet. Some bolts out, sap-rotted throughout. Arches more than compensate for the reduction by sap rot. Arches put in 2 or 3 years after erection. Safe.

No. 22, trestle. No. 22, a 4 span framed trestle; spans, 16 feet, c. to c. Banks held by planks against end trestles. Stringers, two, 7 by 16 inches, packed and spliced. Corbels wider.

No. 23, pile trestle. No. 23, a pile trestle; 32 feet long. New stringers put on recently. Stringers, two, 7 by 16 inches; ties, 5 by 8 inches, oak, 5 inches between; guards, 6 by 8 inches, bolted every 4 or 5 ties. Banks held by lying against planking of old timbers.

No. 22½. No. 22½, similar conditioned as No. 23.

No. 25, trestling. No. 25, trestling, 15 feet c. to c. Ties, 6 by 8 inches; guards, 4 by 6 inches, notched and bolted, but old and poor, do not hold the ties. Ties all very questionable. The cap to one of these trestles should be renewed at once. Stringers have sap rot.

No. 26, Howe. No. 26, a wood through Howe truss of 8 panels, 76 feet span, usual depth and breadth. Over the L. S. & M. S. R. R. Panels, 8; end braces,  $8\frac{1}{2}$  by 10 inches; end truss rods, three,  $1\frac{3}{4}$  inches; lower chords, 5, 6, 6, 5 by 14 inches; floor beams, 7 by 13 inches, 4 to panel; laterals, 6 by 6 inches, and  $1\frac{1}{2}$  inches top and bottom; stringers, two, 5 by 12 inches. Abutments trestle frames, wide as bridge, 20 to 22 feet. This bridge of doubtful safety. Sap rot some places 2 inches deep. Some floor beams sap rotted.

South approach trestling like north approach. Stringers look old, with considerable rot. The trestling should all be carefully examined at earth. Trestles of four 12 by 12-inch batter posts; cap, 12 by 12 inches. The decay appears to be entirely sap rot, so that probably the heart wood is sound.

No. 27, Pratt. No. 27, large iron Pratt truss; 4 spans, of 19.3 feet each. Over the Maumee river at Toledo. Built in 1879 and 1880. Panels, 13; depth of

truss, 27 feet; lower chords at mid-span, four,  $1\frac{5}{8}$  by 5 inches, two,  $1\frac{1}{8}$  by 5 inches, and two  $1\frac{3}{8}$  by 5 inches; main end truss ties, four,  $1\frac{3}{8}$  by 5 inches; end posts, two, 18 by  $\frac{1}{2}$  inches; web plates, one, 20 by  $\frac{1}{2}$  inches; cap plate and 4 angle bars, about 3 by  $\frac{3}{8}$  inches thick; laterals at end,  $2\frac{3}{8}$ -inch rods; stringers of a 21 by  $\frac{3}{8}$ -inch web, and 4 angle bars, 4 by 4 by  $\frac{1}{2}$  inches; floor beams, 26 inches deep; and 4 angle bars, 6 by 6 by  $\frac{9}{16}$  inches. Floor beams riveted to the truss columns, and lower edges extend 8 inches above the pins. Columns of trusses of two, 2 by 8 inches; channel bars riveted, flange out, to an I-beam.

South approach to the 4 spans, pile trestling of  $\frac{1}{4}$  mile length. Being filled, and all under contract to be done probably this fall.

Next a large drawbridge of 290 feet span, and 296 feet total length. Drawbridge. Upper chord arched. Depth of truss at the middle,  $30\frac{1}{2}$  feet, at ends, 27.1 feet; panels, 19; lower chord of 2 web-plates,  $\frac{3}{8}$  by about 12 inches; 4 angle bars,  $2\frac{1}{2}$  by  $2\frac{1}{2}$  inches, by  $\frac{3}{8}$ -inch thick; and bottom plate, 20 by  $\frac{1}{4}$  inches; top side cross slats,  $\frac{1}{4}$  by 6 inches, at 3 feet c. to c. Upper chord similar, also end posts. The main truss tie rods, beginning at end, are, two 5 by  $\frac{1}{4}$  inches, two 1 by 4 inches, two  $\frac{3}{8}$  by 4 inches, one  $1\frac{3}{4}$ , and one  $1\frac{1}{4}$  inches, round. None in next three. Middle panel over wheel ring, two,  $1\frac{1}{4}$  by 3 inches; counters, one,  $1\frac{5}{8}$  inches, round, one, 2 inches, round, one,  $2\frac{3}{8}$  inches, round, two,  $\frac{5}{8}$  by 4 inches, two,  $1\frac{1}{8}$  by 4 inches, two,  $1\frac{3}{8}$  by 5 inches, two,  $1\frac{3}{8}$  by 5 inches, three,  $1\frac{3}{8}$  by 5 inches, middle two,  $1\frac{1}{4}$  by 3 inches. Truss columns at middle panel made of two flange plates, 12 by  $\frac{3}{4}$  inches; 4 angle bars,  $3\frac{1}{2}$  by  $\frac{1}{2}$  inches thick, and slats. Lateral ties, 2 inches round at end; pins,  $2\frac{3}{4}$  inches; floor beams,  $9\frac{1}{2}$  inches, above chord. End post same section as chord. Substantial structures.

North approach new trestling, all strong and sound. Flooring on all about as the standard.

#### GENERAL REMARKS.

It will be observed that though this division, or N. W. O. R'y, has numerous small pile bridges along its line, yet it has 5 spans in iron, one being a draw, which are among the largest in the State. Effect of ice on bridges.

These latter were jeopardized by the ice floe and flood of last winter, it being especially violent on the Maumee river at Toledo. The works of the west approach to the bridge were carried away. But the substantial character of the five iron spans, and of their masonry foundations was sufficient for the emergency.

In going over the road, a large number of workmen were seen engaged at repairs and improvements. Also repairs were found already completed at numerous points. These facts indicate that the road is being much bettered in its condition. Repairs.

One peculiarity respecting the structures of the road is that the majority of the bridges are small pile structures, piles being almost universally employed in place of framed trestling. These pile bridges are being quite generally overhauled and put in satisfactory condition. But some of the larger wooden structures, such as Howe truss bridges, are being less thoroughly renewed in partially decayed parts than is advisable for the entire assurance of absolute safety. Apparently substantial new structures are in prospect for the near future in place of these larger bridges, the present repairs being of a temporary character. Pile bridges.

## Flooring.

The standard flooring of this road for all bridges consists of ties, 7 by 8 inches, by 10 feet length, lying flat, with a space of 5 inches between them, and of oak. The wheel guards to be of oak ties, 7 by 8 inches, beveled on the inside upper corner at 45 degrees, and to an inch extent from the corner, to end at the approach of the bridge, where they are dressed off on the inside to a curve extending around across the whole stick to the outside corner, the bevel being carried with it. They are set 20 inches outside of the rail, notched upon the ties and bolted. This is stated to be Engineer Slataper's standard for the Pennsylvania Co.

## Curves and grades.

The sharpest curve is stated by the road-master to be 4 degrees. Grades are named as high as 60 feet to the mile.

## Elevation of outer rail.

The elevation of the outer rail is stated as being  $\frac{3}{4}$ -inch per degree. The track appears to be in fair condition. The former ties are apparently old, and some of them much decayed; but new ties are going in, thus indicating considerable improvements in the roadway as well as in the structures.

#### 4. The Ashtabula and Pittsburgh Railway, from Ashtabula to Youngstown.

## Numbering.

The structures are numbered by mile posts from Ashtabula; inspected August 23, 1882.

## Trestle near mile-post 6.

At mile-post 6 + 766 feet. Trestle, 100 feet long. Stringers, two, 8 by 16 inches pieces boxed, bolted and break-joints. Bearers, 6 by 16 inches, at end of ties. Ties, wheel guards, etc., standard. All sound and good.

## Trestle, mile-post 6 + 2,955 feet.

At mile-post 6 + 2,955 feet. Trestle, 60 feet long. Examined, and found about like others; all correct.

## Trestle, mile-post 7 + 1,290 feet.

At mile-post 7 + 1,290 feet. Trestle, 91 feet long. Examined, and found all good. Stringers, two, 8 by 16 inches. Bearers, 6 by 16 inches. Spans, 5. All new. Flooring, standard.

## Trestle, mile-post 11 + 595 ft.

At mile-post 11 + 595 feet. Trestle of 4 spans. Middle span, 20 feet. Flooring, standard. Iron guard rails inside on north one-third of floor.

## Eagleville bridge, Howe, mile-post 14 + 247 feet.

At mile-post 14 + 247 feet. Eagleville bridge. A 2-span Howe Truss through bridge. In bad condition. Sap-wood rotted away, and probably much more. Three trestles under each span for support. Flooring bad for decayed wood. Ties and wheel guard poor. Some new floor beams put in to give strength for the present. A new bridge is ordered already, as stated by the superintendent. North approach, a trestle in bad condition; needs stream stone pier with loosened stone.

It appears from the temporary under-trestles and new floor beams that the bridge is carefully looked after, with the effort to maintain safety till the new one is erected.

## Trestle, mile-post 16 + 1,742 feet.

At mile-post 16 + 1,742 feet. A trestle 39 feet long. Stringers, two, 7 by 17 inches, boxed with keys and bolts, and break-joints over the trestle bents. Flooring, standard.

## Deck Howe, mile-post 18 + 2,004 feet.

At mile-post 18 + 2,004 feet. A deck Howe uncovered, over Rock creek. Built in 1880. Span, 118 feet. Depth of truss,  $16\frac{1}{2}$  feet clear. End braces, two, 11 by 11 inches. Next two,  $10\frac{1}{2}$  by 11 inches. End truss rods, three, 2 inches. Next three,  $1\frac{3}{4}$  inches. These are all upset for threads. Lower chords, 6, 7, 7, 6 by 16 inches. Lower, 6, 7, 7, 6 by  $14\frac{1}{2}$

inches. Clamps and keys wood. Floor beams, 7 by 14 inches, 4 to the panel. Stringers, two, 6 by 14 inches. Bearers, one, 6 by 14 inches. Wheel guards, 6 by 8 inches, and 14 inches out. Bolts go through guard bearers and floor beams, once to about every 4th tie. Ties, 6 by 8 inches, notched to 5 inches thick, laid 14 inches c. to c. Laterals, 6 by 6 inches, and 1 to 1½-inch rods, largest at ends of bridge. Sway braces, 6 by 6 inches, seated on cast angle blocks, and 12 sets in the bridge. An excellent wooden bridge.

The north approach, a trestle very badly rotted and disordered. It is to be immediately renewed, timber being on the ground, and partly framed.

At mile-post 43 + 2,211 feet. Trestle over Young's Run, 113 feet long. Stringers, two, 8 by 15 inches, boxed, bolted and breaking joints over trestles, each stringer timber being 2 spans long. Spans, 16 feet c. to c. Bearers, one, 7 by 15 inches. Ties, 6 by 8 inches, lying flat, and notched on the stringers, placed 14 inches c. to c. Wheel guards, 6 by 8 inches, notched 1 inch, bolted every 8 ties, placed 17½ inches out. Trestles end on bank, with a set of 8-foot ties laid lengthwise, upon which is laid a 12 by 12-inch sill crosswise, and on which latter is a second 12 by 12-inch stick to receive the stringers. The trestle frames consist of a 12 by 12-inch mudsill and cap, of 2 plumo posts, 12 by 12 inches, and 2 batter posts, 10 by 12 inches, and 3 by 12-inch sway braces crossing. At mid-height longitudinal stays are fastened in the highest trestles as in the present one.

Trestle, mile-post 43 + 2,211 feet.

At mile-post 58 + 138 feet. A trussed girder bridge, 32 feet long. Girders, two, 8 by 16 inches, under each rail. Truss rods, three, 1½ inches. Struts from girders to rods, two, at about 10 feet apart and 27 inches long. Over little Squaw creek.

Trussed girder, mile-post 58 + 138 feet.

At mile-post 52 + 3,143 feet. A trestle 60 feet long formerly, but now filled to 10 feet opening and renewed. Others near here similarly partly filled and renewed.

Trestle, mile-post 52 + 3,143 feet.

At mile-post 52 + 4,067. A through Howe wooden truss, uncovered. Over Mosquito creek, 66 feet long. 6½ panels. Width, 14 feet. Built about in 1870. Lower chord, 6, 7, 7, 6 by 13 inches. Braces at end, 8 by 10 inches. End truss rods, two, 1½ inches. Floor beams, 7 by 14 inches, 4 to the panel. Laterals, top and bottom, 6 by 6 inches, and 1-inch rods. Stringers, 10 by 12 inches, with 2-inch plank on top. Bearers, 6 by 12 inches, and 2-inch plank laid on. Ties, 6 by 8 inches, oak, 14 inches c. to c. Wheel guard, 6 by 8 inches, oak, bolted every 8 ties, and notched. Floor beams not firmly secured, have become displaced to irregular spaces. Timber of chords sounded with the boring bit and found sound, but the wood was damp inside. Clamps and keys of iron.

Through Howe, mile-post 52 + 4,067 feet.

At Youngstown, a plate girder, 40 feet span. Depth, 4 feet. Has 9 vertical web stays of angle bar, 3 by ¾ inches. Stringers of 14 by 5-inch I-beams of ½-inch webs. Ties, 8 by 9 inches, on edge. Wheel guard, 6 by 8 inches, flat, notched and bolted to stringer every 3d tie, placed 15 inches out. Lateral ties, ½ by 4 inches. Over Crab creek.

Youngstown plate girder.



## GENERAL REMARKS.

Steel rail.

This road will have  $11\frac{1}{2}$  miles of steel rail by the end of the season, and nearly all stone ballast. The small bridges and trestles appear to be in better order than the larger bridges, with the exception of one or two of the larger, which are excellent, and nearly new. The purpose seems to be to renew small structures immediately, and larger ones soon, or within one or two years.

Small structures.

Elevation of outer rail.

The elevation of the outer rail here is determined on the spot by section men, by a most simple practical rule, viz.: The versed sine of an arc, whose chord is 63 feet, is taken for the proper elevation. With this rule the men stretch a line of 63 feet length, hold a rule at the middle of line to get the distance from rail to line. This distance is the difference of level of one rail with respect to the other. This mode of finding the elevation is an excellent one in many respects; 1st, it can be applied by the most ordinary intelligence; 2d, it gives the elevation at exactly the point where it is needed, so that if a curve is deranged from its original circle line, the elevation found at any point is right for that point; and 3d, it detects any wild distortion of the curve as occasioned by continued use, and tamping of ballast about ties.

5. The Lawrence Railroad, from State line to Youngstown.

Structures numbered by mile-posts. Inspected August 23.

Through Howe, mile-post 12 + 2909 feet.

At mile-post 12 + 2909 feet. A through Howe wooden truss, uncovered. Span, 43 feet. Depth of truss, 22 feet. Width, 14 feet. Spans, 5. Lower chords, 5,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$ , 5 by 12 inches. Braces at end, two,  $7\frac{1}{2}$  by 8 inches. End truss tie rods, two,  $1\frac{1}{2}$  inches. Clamps and keys wood. Floor beams, 7 by 12 inches, 4 to the panel, with sap wood decayed. Stringers, 10 by 12. Bearers, 6 by 10 inches. Ties, 6 by 8, oak, 14 inches c. to c. Wheel guards, 6 by 7, on edge, notched and bolted every 6 ties, and spiked at every 3 ties as an average; placed 32 inches outside. Over Nebo run. Built in 1876. Stone abutments.

Through Howe, mile-post 13 + 1984 feet.

At mile-post 13 + 1984 ft. A through Howe wood truss, 89 feet span; 21 feet depth of truss, and 14 feet wide. Lower chords, 6, 7, 7, 6 by 14. Clamps at each panel, iron. End braces, two, 9 by 11 inches. End truss tie rods, two,  $2\frac{1}{8}$  inches, and one 2 inches, not upset for threads. Floor beams, 7 by 14 inches, 5 per panel. Stringers, two, 6 by 12 inches. Ties, oak, 6 by 8 inches, and 14 inches c. to c. No bearers outside. Wheel guards, 16 inches outside from rail. No iron guard rails in either the above. Stone masonry abutments in good condition. Over Yellow creek. Built in 1878.

Through Howe, mile-post 15 + 2147 feet.

At mile-post 15 + 2147 feet. A through Howe wood bridge of 2 spans, not covered; built in 1877. Over Mahoning river, near Youngstown. Span, 102 feet. Panels, 10. Lower chords,  $6\frac{1}{2}$ , 7, 7,  $6\frac{1}{2}$  by 14 inches. Braces, two, 9 by 10 inches. End truss tie rods, two,  $1\frac{3}{8}$  inches, and one  $1\frac{1}{2}$  inches. Floor beams, 7 by 14 inches; 4 to panel. Stringers, two, 6 by 12 inches, and 2-inch planks laid on top. Side bearers, 6 by 12 inches, and 2-inch planks. Ties, 4 by 8, oak; 9 to panel, somewhat decayed. Wheel guards, 5 by 6, notched, bolted every 6 ties, and spiked between; placed 32 inches outside. Badly rotted. Need for new guards, and one-fourth the number of new ties. Good stone abutments.



GENERAL REMARKS.

Expect to finish this in stone ballast and steel rail in about a year.

GENERAL REMARKS UPON THE PENNSYLVANIA COMPANY'S RAILROADS IN OHIO.

The character and costliness of the bridge structures on these lines varies considerably. The P., Ft. W. & C. line has a great number of iron bridges, and wooden bridges of any magnitude are the exception. A great number of them are 60 feet or less in length, and are usually iron plate girders. There are also a large number of iron truss bridges. The C. & P. line, direct from Cleveland to Bellaire, has a more nearly equal division into iron and wooden bridges, while the N. W. O. line has no iron bridges, except the large ones over the Maumee river. Other lines and branches have no iron bridges, with the exception of the one plate girder at Youngstown.

Characters of bridges.

This distribution of iron structures appears to be nearly in proportion to the passenger transportation, which, conceding to iron the greater safety, will be accepted as the most judicious arrangement for a given expenditure on all the company's lines.

Distribution of iron structures in proportion to passenger transportation. Superintendents.

All superintendents and engineers met in the tour of inspection over these lines, appear deeply in earnest in their efforts to secure the highest possible degree of excellence and safety for their respective divisions. The various lines are found in good condition, and the main lines excellent. It is gratifying to find the small structures carefully watched, and that they are mostly after some certain adopted standard, for which, with materials on hand, repairs can speedily be made; this is true of culverts to some extent, and of cattle guards, though the standard is not the same on all the lines and branches. Trestles of one line differ somewhat from those of another, as for instance pile supports prevailing on one, while framed bents are chiefly in use on another.

The flooring of bridges is nearly the same throughout all the lines and branches; the term flooring being used now to include only ties and wheel guards. The standard flooring consists of sawed ties, 6 or 7 by 8 inches, usually lying flat, 10 feet long, oak. The wheel guards, or outside guard rails, are of the same material, placed on the side, with the inside top corner beveled 1 inch at 45 degrees, spliced, flared outward at the termination at bridge approach, and notched about 1 inch upon the ties. Bolts hold the guard rail at about every fourth tie, and they are placed at from 14 to 30 inches outside, usually about 20 inches.

Flooring of bridges.

In the track, it is stated that suspension joints formed with the angle bar and verona lock-nut and bolts for fastenings are standard, and mostly in use. The joints are said to be placed alternate in all cases.

Track.

Stone ballast 10 inches deep under the ties, and sometimes deeper. The standard switch is the Wharton switch, for a description of which see *Railroad Economics* at another part of this report. The Loren switch, also described, *ib.*, is objected to, unless the safety spring is removed, as a pebble or other obstruction may prevent the full throw of the switch. The spring frog is not in favor on some parts of the line. An excellent frog, for simplicity, is made by the company at its shops; the same being apparently the result of much study and experience. It is probably the simplest efficient frog made.

Ballast.

Rails at all points show some degree of "tow joints," but it appears to be least on the stone and slag ballast.

**Train schedules.** Trains are run by a schedule and dispatcher, under the combined care of two persons. No block-signal systems were pointed out as in use on any of the lines.

**Quality of iron.** The quality of iron in the bridges can not be stated here, because no methods of inspection exist, which enable inspectors to ascertain qualities of pieces of iron while in structures.

# VII. CINCINNATI, VAN WERT AND MICHIGAN RAILWAY, from Van Wert northward to Shane's crossing. Inspected September 8, 1881.

Gauge of track, 4 feet 8½ inches, formerly narrow gauge. Structures number from Van Wert each way.

## 1. North of Van Wert.

**No. 1, trestle.** No. 1, a 4-span trestle at Van Wert; two spans 15 feet, and two 12 feet. Height above bed of stream, 11 feet to top of rail. Trestle bents, two of them, have each 4 plumb posts and 2 batter posts, with sills and caps. Others like those further north, Nos. 4 and 5. Stringers, two, 6 by 12 inches, "boxed." Bolster, 11 by 12 inches, notched. Ties like those of Nos. 3 and 4. Abutments, by plank walls lying against end trestle bents.

**No. 2, trestle.** No. 2, a trestle of 4 full spans, and 2 bank half spans. Over Town creek. Trestle bents with 6 plumb posts, four 10 by 12 inches, and two 10 by 10 inches. Two batter posts, 6 by 10 inches; all oak. Some parts of these bents apparently added to strengthen for change from narrow to full gauge. Corbels, 12 by 12 inches by 8 feet. Spans, 15 feet. Stringers, 10 by 12 inches, edgewise. Flooring of 6 by 8-inch by 8-foot ties, flat, except every fourth on edge and notched. Space between ties, 10 inches. Rails spiked only on alternate ties. The ties are held in correct spacing by 1 by 3-inch blocks of 10 inches length, being nailed on stringers between ties. Height of rail above bed, 8 feet.

**No. 3, trestle.** No. 3, trestle of 2 main spans, of 16 feet each. Bents have two, 12 by 12-inch plumb, and two 10 by 12-inch batter posts, with sill and cap, 12 by 12 inches. Sills set on blocks. Corbels, 12 by 12 inches by 8 feet. Stringers, 12 by 16 inches on edge, and 16 feet long. Whole structure 64 feet long, the terminals at bank resting on blocks, and ties bedded as in No. 4. Height above bed, 7 feet.

**Culverts.** Next are 2 culverts, 5 or 6 feet span, with oak timber walls, and 12 by 12-inch stringers.

**No. 4.** No. 4, same build and dimensions as No. 3, which is the standard for small trestles. Three main spans, and the two bank spans. The banks terminate without walls, the earth sloping toward nearest trestle. On bank a floor of common ties are laid, with individual ties parallel to track. On these, crosswise, are placed one or two 8 by 10-inch blocks, upon which the ends of the trestle stringers rest. The trestle bents are carried on blocks, which are laid lengthwise the track on the earth.

**No. 5, trestle.** No. 5, trestle with two main spans, and made like others; except here are no corbels, and the spans are 12 feet.

**No. 6, trestle.** No. 6, trestle with one 12 feet and one 14 feet main span. Made like others.

**No. 7.** No. 7, one main span, 14 feet; stringers, 12 by 16 inches on edge. Hewn timber. Batter of all batter posts, 4 inches in 12 inches.

Near No. 7 the track ends in timbered land, about 10 miles from Van Wert.

2. South of Van Wert. This includes the larger portion of the road.

No. 1, a trestle, about 3 spans in length. Low creek, dry. Situated between Van Wert and Enterprise. This trestle is as made for the narrow gauge. But it is condemned by the company as too light for the present gauge and traffic, and a new trestle is already ordered. No. 1, trestle.

No. 2, near Shanes; over St. Mary's river. A queen-post truss of about 36 feet span, and 8 feet extreme depth. A trestle is placed under the middle for a central support. Lower chords, two, 6 by 12 inches, combined; upper, 12 by 12 inches; vertical ties, one 1½-inch and two 1½-inch rods, each. The middle or rectangular panel has two braces from panel points of lower chord, inclined toward each other, and butting against the ends of a single block of about 2 feet length on underside of top chord. Floor beams, two, 6 by 12 inches, one set at the panel points, and one at the middle. Abutments each consist of a double framed trestle, each trestle frame having 5 plumb and 2 batter posts, all 10 by 10 inches. Cap, 10 by 10 inches; and sill, 12 by 16 inches. No. 2, near Shanes, queen-post.

North approach a span of 15 feet, with stringers, each three, 7 by 12 inches, and partly continuous over upon the truss. North wall formed by planks lying against the north trestle bent to hold the dirt up. Trestles, three, 10 by 10-inch upright, and two, 6 by 10-inch batter posts. Cap, 10 by 10 inches, and a sill.

South approach a trestle of two spans, of 16 feet each. Stringers same as on north approach. Bank held by planks, etc. No bolsters.

Flooring as to ties, etc., same as north of Van Wert.

No. 3, a trestle of 600 feet length. Banks at end of opening held by planks against trestle bent. Spans, 20 feet, with 12 by 12-inch bolsters notched on caps. Bents of four, 10 by 10-inch plumb, and two, 10 by 10-inch batter posts; a 10 by 10-inch cap, and 12 by 16-inch sill. These sills rest on 6 mud-blocks or timbers, running the whole length of trestle, thus securing an extended bearing upon earth. Stringers, two, 6 or 7 by 12 inches, boxed, and of 30 feet timbers, breaking joint. A bolt through stringers and each end of bolster with nut on below. No. 3, trestle.

From Nos. 2 to 3 is a fill of about 600 feet length in the broad river bottom. Apparently one opening is needed at this stream. Fill.

These structures are of ample strength.

#### GENERAL REMARKS.

The surface of the country along the line is quite even and flat, so that no heavy cuts or fills are required. Bridges and trestles are not high. The actual roadway is almost without cuts or fills, and with comparatively heavy grades, so as to skip along the surface of the country. Surface of country.

The full gauge rails were laid outside the narrow gauge rails equidistant, but the lighter narrow gauge rails are not at all employed in the new track, and at the time of the inspection were largely though not entirely removed from the ties. Gauge.

The rails first put down on the full gauge were 45 lbs. per yard, with fish-plate fastenings, 4 bolts, and no locknuts. Where the track is regarded as finished, the rails are spiked at every tie. From this on, Rails.

the new rails will be 56 lbs. per yard, and of the so-called Sandbery pattern. The section of the 45 lbs. rail is  $3\frac{1}{2}$  inches high, the head 1.9 inches thick, with sides nearly vertical. Stem,  $\frac{7}{16}$ -inch thick; foot,  $3\frac{5}{16}$  inches wide, by  $\frac{5}{16}$ -inch thick at very edge, and  $\frac{3}{4}$ -inch thick at stem. The sides of the stem are concave with fillets at junction with head and foot. The underside of the head makes about the same angle with the stem as does the top surfaces of the foot. Width of fish-plate at middle of its thickness, about  $1\frac{1}{2}$  inches. Top of head crowned to about an 8-inch radius.

Engines.	The road has now but one engine of 40 tons. Two more will be put to use on December 1, next
Maximum speed.	Maximum speed of trains about 20 miles per hour. Track has no very sharp curves.
North of Van Wert.	North of Van Wert the track ends in timbered land, about 10 miles from Van Wert.
Traffic.	The largest portion of traffic appears to be of timber and lumber on this portion of road. A considerable portion of this road is new. All the above trestles, except Nos. 1 and 2, are nearly new.
General condition.	The ballast is defective and deficient, and the rails are full of short bends, several within a rail length, due to yielding of bed and ballast as the trains are run over. Near Van Wert these defects of track are slight, and they will be made less throughout as the track is worked upon and trimmed up to line. Creeks are all nearly dry.

#### VIII. TOLEDO, CANADA SOUTHERN AND DETROIT R. R.

The following notes were obtained while, riding over the road, from that part of the Canada Southern extending from Toledo, Ohio, to the State line, north:

Trestle.	A trestle, some distance from Toledo, about $\frac{1}{2}$ mile in length, with 90 bents. Timbers of the trestle frames about 12 by 12 inches. Caps long and extending out some distance beyond the ties; other timbers also, so that 6 barrels of water are distributed along and supported on the overreaching timbers, and ready for extinguishing fires on trestling. Span of trestling, about 12 or 14 feet. Ties, about 6 by 8 inches, flat, and placed 16 or 18 inches c. to c. Ribbons of about 5 by 6 inches, bolted at 10 or 12 inches outside from track rails. Height of trestling in the main varying from about 15 to 20 feet. Trestle has longitudinal stays.
	Farther north, at a railroad crossing, is another trestle of 14 bents, constructed about like the first above.

#### *State Line.*

Rails.	The rails of the track are marked by the mill rolls "Scranton Steel," and said to be English. Rails laid with the fish-plate joint fastenings as far as to the crossing named above. Beyond that, some angle bar fastenings are used. The rails are laid with opposite joints respecting the two rails.
Trestles.	The trestles are nearly new, and in fine condition; also culverts and cattle guards. The track, including rails, ties and ballast, all good. The road in all parts appears to be well cared for and kept up.

IX. NEW YORK, PENNSYLVANIA AND OHIO RAILROAD. Inspected November 11, 12 and 25, 1881.

Gauge of track, 4 feet  $8\frac{1}{2}$  inches.

1. Cleveland and Mahoning Valley Railway—The "Mahoning Division," from Cleveland to Sharon, Pa.

No. 1, at Cleveland; over the C., C., C. & I. R. R. track. A through Pratt truss of iron, just completed. East truss, 17.6 feet long, with 10 equal panels. West truss, 164 feet, with 9 equal panels. Depth of trusses, 28 feet between pins. Width, c. to c. of trusses, 16 feet 6 inches. Lower chords, fourth panel from end of truss, four,  $1\frac{1}{2}$  by 5 inches. End two panels, two,  $1\frac{5}{8}$  by 5 inches. Main truss tie rods from top of end post, two, 2 by 5 inches. End posts, two, channels, 3 by 12 inches, with  $\frac{5}{8}$ -inch web; plate,  $22\frac{3}{4}$  by  $\frac{5}{8}$  inches, and slats. Top chord of same form. Counter ties begin in fourth panel. Third truss columns, two, channels  $2\frac{1}{2}$  by 10 inches, with slats, and all 10 by 15 inches. Floor beams carried by large longitudinal beams at lower chords, supported by the main trusses. These end at the end post pedestals, and inside the end post channel bars. Bolts are depended on for securing the ends of these beams to the pedestals. Bolts were loose at the time of inspection, and the ends of the beams belayed about as trains passed. The stretch of the lower chords in tension under load, and not these bearers will, quite likely, give trouble in securing thus by bolts. It appears desirable to use close surface bearings between the end posts and beam ends, for preventing lateral motion of beams. Floor beams are  $5\frac{1}{2}$  by 14-inch I-beams, 4 to the panel, placed crosswise the track, with ends fastened to the longitudinal beams. Stringers are 4 by 8-inch I-beams. Bearers, 3 by 6-inch I beams. Lateral ties hold into the longitudinal beams above described, the floor beams serving as struts. At end the lateral tie rods are  $1\frac{1}{8}$  by 5 inches, flat Middle,  $\frac{1}{2}$  by 3 inches. Ties, 6 by 9 and 7 by 9, alternating, and to be set with chairs of iron. Guard rail, wood,  $5\frac{1}{2}$  by  $5\frac{1}{2}$  inches, at 10 inches outside. In the 6 or 8 feet of top of bridge is a system of sway bracing, with horizontal cross struts of two 6-inch channel bars to each, and diagonal tie rods,  $1\frac{1}{2}$  inches. Upper laterals about  $1\frac{1}{2}$  inches at end, and 1 inch at middle. Built by the Morse Bridge Company of Youngstown, Ohio.

No. 1, Cleveland, through Pratt.

No. 2, a deck Howe of 80 feet span, uncovered. 11 panels. Depth of truss about 9 feet. Upper chords, 6, 7, 7, 6 by 11 inches. Truss tie rods at end, five, 2 inches. Lateral ties, 1-inch rods. Sway braces, 8 feet apart. Floor beams, 7 by 16 inches, at 3 feet c. to c. Stringers, two, 6 by 12 inches. Ties, 4 by 9 inches, 3 inches between. Guard rails, 5 by 6 inches, notched on ties 1 inch, and bolted every 4 feet. A strong and excellent bridge. Over Scranton avenue. Masonry abutments.

No. 2, deck Howe.

No. 3, a through Howe wooden bridge, with trusses separately covered, battened and painted. Span, 120 feet, and 10 panels. Width, clear,  $18\frac{1}{2}$  feet. Switch on bridge. Over Scranton avenue. Lower chords, 6, 7, 7, 6 by 14 inches. Braces in 3rd panel, 8 by 10 inches. Counters, 7 by 9 inches. Floor beams, 8 by 16 inches, 2 feet 10 inches c. to c. Stringers, two, 6 by 13 inches. Bearers, 6 by 13 inches. Ties, 4 by 9 inches, 3 inches between. Guard rail, 5 by 6 inches, notched 1

No. 3, through Howe.

inch on all ties, and bolted 4 feet apart. Abutments of good stone masonry. All in excellent condition.

No. 4, deck  
plate girder.

No. 4, deck plate girders over central way. Length of bridge, 100 feet. Width over all girders, 34 feet. 3 tracks, with 2 girders to each track, and boxed, to separately carry the tracks. Depth of girders, 4 feet. Ties, 5 by 12 inches. Guard rails, 5 by 6 inches, notched on ties. Masonry abutments.

30 feet span.

East of above is a 30-foot span in construction. Excellent stone abutments going in, 10 feet thick.

No. 5, deck  
draw-bridge.

No. 5, a deck draw-bridge, over the Cuyahoga river, 80-foot span. An iron Post's Truss. Track stringers, three, 6 by 12 inches. Bearers, one, 6 by 12 inches. Ties, 4 by 9 inches, at 3 inches between. Guard rails, 2 feet 8 inches out, on ends of ties.

East approach, a deck Post's Truss of iron. Span, 70 feet. Panels, 9. Lower chord, about six,  $\frac{5}{8}$  by  $2\frac{1}{2}$  inches. Truss appears light, except for the 4 channel bar arches of 8 inches each, carried over to aid in supporting truss. Built by Claffin & Co.

No. 6, Pratt  
deck.

No. 6, an iron deck Post's Truss, over the Ohio canal. Deck depressed by suspending the floor beams from the upper chords. Span, 83 feet. Depth,  $8\frac{1}{2}$  feet c. to c. of pins. Upper chords, two, channels 8 by  $\frac{5}{8}$  inches, and plates, 12 by  $\frac{1}{4}$  inches, boxed. End post similar, but slats, 8 by  $\frac{1}{4}$  inches, and vertical. First truss tie from top of end post, two,  $\frac{3}{4}$  by 4 inches. Second truss tie from top of same end post, and reaching a panel farther, two,  $\frac{5}{8}$  by 3 inches. Inclined columns, all two channels, and plates boxed, 6 by 7 by  $\frac{1}{4}$  inches. Lower chord at the middle, eight,  $\frac{5}{8}$  by 3 inches. Laterals, 1-inch tie rods. Sway tie rods, 1 inch. Pins, 2 inches. Floor beam suspenders, 2-inch rods, 3 feet long. Panels of upper chord, 14. Ties, 4 by 9 inches, laid 3 inches between. Guard rails, 5 by 6 inches, and 9 inches out. Iron guard rail inside. By King Bridge Co.

No. 7, wood  
Howe deck.

No. 7, a wood Howe deck of 160 feet span, covered. Depth of truss, 15 feet. Over the Cuyahoga river. Lower chords, 6, 7, 7, 6 by 14 inches. Iron clamps and keys set in paint. End panel braces, two, 9 by 11 inches. Counter,  $7\frac{1}{2}$  by 8 inches. Truss ties at end panel, two,  $1\frac{1}{2}$  inches, and two,  $1\frac{1}{2}$  inches. Panels, 11. Sway braces in 9 sets. Laterals, 6 by 6 inches, and  $1\frac{1}{4}$  inches, top and bottom. Iron angle blocks, supported through chords by tubes. One-half the upper lateral braces are out, but will be put in at once. Ties, 4 by 9 inches, flat, 3 inches between. Guard rails, 5 by 6 inches, notched 1 inch, and laid 21 inches out. Abutments of stone masonry and apparently all good. Built in 1867.

Iron plate  
girder.  
No. 8, iron  
plate girder.

An iron plate girder, 30 feet long, not numbered.

No. 8, at 43rd mile-post. An iron plate girder,  $65\frac{1}{2}$  feet long, by the Keystone Bridge Co. Built in 1878, over Eagle creek. Depth of girder,  $5\frac{1}{2}$  feet. Chords, 15 inches wide. Section at middle about  $17\frac{1}{2}$  square inches. Vertical web stays or stiffeners, 13 in the length, and of T-iron, 5 by 3 inches, inside and outside of webs. Width between webs, 15 feet. Floor beams of 10-inch I-beams, 24 in number to bridge, and resting on lower flanges. Stringers, wood, 8 by 16 inches, flat. Ties, 4 by 9 inches, by 12 feet length, flat, and laid 3 inches between. Wood guard rail, 5 by 6 inches, flat and notched. Lateral ties, 1 inch, in 4 panels. Sway bracing by several 5 by 5-inch I-beams, extending across under



girders and projecting 30 inches, from the ends of which 3 by 3 by  $\frac{3}{8}$ -inch cross angle bars connect with the top chord. Guard rails extend 10 feet on banks. Girder slides on wall plate for expansion.

No. 9, a through Howe wooden truss of 150 feet span. 23 feet total depth. 14 panels. Erected in 1874, and independent arches added in 1879, springing from abutments. Lower chords, 7, 8, 8, 7 by 15 inches. End panel main braces, two, 10 by 12 inches, and ties, three, 2 inches. Laterals, 6 by 6 inches, and  $1\frac{1}{4}$ -inch rods. Panels, 14. Clamps and keys of lower chord, iron. Upper chord keys, wood. Stringers, 10 by 12 inches, on edge. Bearers, 7 by 12 inches. Floor beams, 5 to the panel. Ties and flooring, standard of the road. Abutments of stone masonry.

No. 9, through Howe.

No. 10, iron deck plate girders, over the Mahoning river. Three spans and 2 tracks. By the Keystone Bridge Co., in 1878. Depth, 6 $\frac{1}{2}$  feet. Width, 8 feet c. to c. Spans, 70 feet each. Two trusses for each track. Bridges independent, by a space between ends of ties of 1 $\frac{1}{2}$  inches. Total thickness of flanges of girder at mid-span, 1 $\frac{1}{2}$  inches. Width, probably 12 or 14 inches, with angle bars between flange and web. Stays to web, 11 in all. Laterals in Warren's girder style, of 3 $\frac{1}{2}$  by  $\frac{3}{8}$ -inch angle bar, riveted on lower and upper flanges. Sway ties,  $\frac{1}{2}$  by 3 inches, and 12 to the span. Ties, 8 by 12 inches, and 12 feet length, and lying directly on girders. Guard rails, 5 by 7 inches. Lower chords joined by a plate over the piers. Abutments of good stone masonry. By Keystone Bridge Co.

No. 10, iron deck plate girder, Mahon'g river.

At the Ashtabula and Pittsburgh crossing; below grade a plate girder was put in by that road. Length of girders, 29.7 and 34.6 feet. Depth of girder, 3 feet. Upper flange, 9 by  $\frac{7}{16}$  inches, and two, 2 $\frac{3}{4}$ -inch angle bars. Lower flange, 14 by  $\frac{3}{8}$  inches, and two, 2 $\frac{3}{4}$ -inch angle bars. Both flanges same throughout. Web, 1 $\frac{1}{4}$  inch thick. Vertical web stays, 7, including ends. Sway bracing by railroad rails across, under, and struts from overreaching ends to top flange. Also inside are short, light struts from the four, 3 by 6-inch I-beams up to flanges, the I-beams being struts to the lateral system of 4 panels. Lateral diagonal ties,  $\frac{3}{8}$ -inch rods. Floor beams, oak, 8 by 12 inches, resting on lower flange and bolted, 17 to the truss, and serving as ties for rails and guard rails. Latter, 5 by 8-inch oak; whole, apparently light. A wood trestle bent under, near center of span. North abutment wall leaning in at one end, and topped out with about 4 feet of blocking. Approach for about 12 feet, north end, short of top filling and occupied by stringers and blocks. Structure in several respects rather unsatisfactory.

A. & P. crossing, pl. girder.

No. 11, at Niles, over a mill-race, a deck Howe of 64 feet span, built in 1873. Trestle bents under at each quarter. Depth of truss, 11 feet. End truss tie rods, four, 1 $\frac{1}{4}$  inches. Is to be renewed next year.

No. 11, Niles, deck Howe, over mill-race.

No. 12, the former wood Howe burned out, and flooring put on temporary piling for the winter. An iron bridge, same as No. 35, ordered to be in by next May. Over Mosquito creek.

No. 12, Howe.

No. 13, iron plate girder, 55 $\frac{1}{2}$  feet long. Depth, 4 $\frac{1}{2}$  feet. Over Squaw creek. Built in 1878. Upper flange at middle, 3 plates, together 15 $\frac{1}{2}$  by 1 inches, and 2 angle bars, 4 by about  $\frac{1}{2}$  inches. Lower flange, 3 plates, together 15 $\frac{1}{2}$  by 1 inches, and 2 angle bars, 4 by about  $\frac{1}{2}$  inches. Floor beams serve as ties, 36 to bridge, resting on lower flange, each 8 by 14 inches. Lateral system in 4 panels. Struts, each two, 2 $\frac{1}{4}$  by 6-inch channels, with tie rods, 1 $\frac{1}{8}$  inches. Gusset plates from lateral struts

No. 13, iron plate girder.



to top flanges for sway staying. Guard rail, wood, 3 by 12 inches, flat. Foundation, stone. Built by Cofride & Taylor.

**No. 14, thro'gh Howe.** No. 14, a through Howe of wood, over Mill creek, near Youngstown; built in 1873. Length, 33 feet. Depth, 6 feet inside of chords. Lower chord, 6, 8, 6 by 12 inches, without splices. End panel braces, one, 7 by 14 inches. Ties, two, 1 $\frac{3}{8}$  inches, and two, 1 $\frac{1}{2}$  inches. Floor beams, 3 per panel.

**Trestle east of Youngstown.** East of Youngstown, a trestle without number on it. Bents, 5, with 2 half-bents on the banks. All of piles. Spans, 14 feet c. to c. Caps, two, 6 by 14 inches, notched on sides of pile heads, and bolted.

**No. 15, thro'gh Howe.** No. 15, a through Howe Truss of wood, uncovered. Built in 1868. Over small creek. Span, 64 feet. Panels, 8. Depth, 8 $\frac{3}{4}$  feet between chords. End panel braces, 8 by 8 $\frac{1}{2}$  inches. Tie rods, two, 1 $\frac{3}{4}$  inches. Floor beams, 7 by 16 inches, 3 per panel. Bearers, 5 by 12 inches. Stringers, two, 5 by 12 inches.

Ties, 4 by 9 inches, 3 inches between. Lower chord, 5, 12, 5 by 14 inches. Outer timber spliced at opposite sides of middle tie rod, and the inner timber, near the ends of truss. Foundation, stone. Bridge considered by the company weak with age and increased train loads. Will probably be renewed within two years.

**No. 16, trestle, Yankee river.** No. 16, a trestle 100 feet long, over Yankee river. Built in 1878.

**No. 17, thro'gh Howe.** No. 17, a through wood Howe Truss, 10 years old. 110 feet span. 11 panels. Depth, 23 feet over all. Lower chords, 6, 7, 7, 6 by 14 inches. Clamps and keys iron. End panel braces, 8 by 11 inches. Tie rods, two, 1 $\frac{1}{4}$  inches, and two, 1 $\frac{7}{8}$  inches. Four floorbeams per panel. Ties, standard. Abutments, stone masonry. Will shortly place 2 trestle bents for supplementary support. Sap wood gone, and structure appears old.

**No. 18, iron bridge.** No. 18, a new iron bridge of 120 feet length going in, on stone foundations. Over Yankee Run, by Kellogg & Maurice, of Athens, Pa.

**No. 19, thro'gh Howe.** No. 19, a through Howe wood truss of 100 feet span; 23 feet depth of truss, and 10 panels. Lower chords, 6, 7, 7, 6 by 14 inches. End panel braces, two, 8 by 11 inches; and tie rods, two, 1 $\frac{7}{8}$  inches, and one 1 $\frac{1}{2}$  inches. Laterals with 1 $\frac{1}{2}$ -inch rods. Floor beams, 4 to the panel. Stringers, 10 by 12 inches, and bearers, 5 by 12 inches. Trestles under at 6 feet from the ends of the truss. Will soon have trestle bents under at the quarters. Over Yankee run. Built in 1872.

**No. 20, new iron bridge.** No. 20, a new iron bridge of 150 feet span going in. Over Yankee river. Built by Kellogg & Maurice.

**No. 22, at Sharon, Pa.** No. 22, in Pennsylvania at Sharon, and a short distance from the State line. Made by Kellogg & Maurice in 1880. A Warren's truss.

## 2. The Niles and New Lisbon Division.

**No. 1, through Howe.** No. 1, a through Howe truss; over the Mahoning river. Two spans, each of 133 feet, covered. Depth of truss, 23 feet. Panels, 12. Lower chords, 6, 7, 7, 6 by 16 inches, and lower 12 inches deep. End panel braces, two, 8 by 12 inches, and tie rods, three, 2 inches. Floor beams, 4 to the panel. Stringers, two, 6 by 12 inches. Bearers, one, 6 by 12 inches. Flooring, standard. Built in 1876. Masonry abutments. Covered about a year ago.

North approach a pile trestling over the A. & P. R. R. Main stringers, two, 7 by 16 inches. Located at Niles.

No. 2, a through Howe truss of wood of 64 feet span, with stone foundations. Built in 1872. Located about  $1\frac{1}{2}$  miles south of Leetonia. No. 2, through Howe.

3. The Main Line, from east State line to Dayton, Ohio.

No. 30, east of Warren, a deck truss of iron, of 92 feet 8 inches length, and same construction as Nos. 35 and 43, and nearly same length. See No. 43 for full description. Over Mosquito creek. Foundations, stone. Built by Kellogg & Maurice in 1881. No. 30, east of Warren, deck truss.

No. 31, west of Warren, at mile-post 161 $\frac{1}{2}$  from Salamanca. An iron riveted deck truss bridge of 3 spans, of 97.6, 97.6 and 59 feet. Built in 1880, by Kellogg & Maurice. Construction same style as No. 43. Riveted together in place. Masonry abutments. Wood floor beams, resting on top of trusses. Over the Mahoning river. No. 31, west of Warren.

No. 32, a through iron Pratt Truss of 141 feet span. Nine panels. Depth of truss, 24 feet between pins. Lower chord at middle, four,  $1\frac{3}{8}$  by 5 inches. End main tie, two,  $1\frac{5}{8}$  by 5 inches. Lateral ties at end,  $1\frac{3}{4}$  inches. End posts, two channels, 12 inches, 1 plate, 20 inches, and slats diagonally. Top chord same. Stringers, three, 8 by 16 inches, wood, and bearers. Flooring, standard. Over the Mahoning river. Foundations of stone masonry. Built by Morse Bridge Co., of Youngstown. No. 32, through iron Pratt.

No. 33, a parabolic plate girder of iron, the upper chord being arched. Span, 63 feet. Depth at center, 7 feet. Top chord or flange, a 12 by 3 by  $\frac{3}{8}$ -inch thick channel bar with channel flanges down. The plate girder web is joined to the web of top channel by 2 angle bars, 3 by 4 by  $\frac{5}{8}$  inches. Area of upper flanges about 19.4 square inches. Lower chord or flange, 12 by  $\frac{5}{8}$  inches, and 2 angle bars, 4 by 4 by  $\frac{5}{8}$  inches. Section, about 18 square inches. Depth of girder at very end, 10 inches. Floor beams of iron, and riveted to girders by gusset plates or angle plates, extending to top flange for sway brace staying. Five intermediate floor beams to the bridge, and 6 panels. Laterals consist of floor beams for struts and diagonal tie rods,  $1\frac{1}{4}$  inches in diameter. Stringers, wood, three, 8 by 16 inches. Flooring, standard. Masonry abutments. Over Eagle creek. By the Morse Bridge Co., in 1880. No. 33, parabolic plate girder.

No. 34, a Howe deck of wood, 9 years old. Over the Break Neck river. Span, 50 feet. Depth of truss, 12 feet out to out. Lower chord, 5,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$ , 5 by 14 inches, with iron clamps and keys. End panel braces, 9 by 9 inches, and ties, two,  $1\frac{3}{4}$  inches, and two,  $1\frac{5}{8}$  inches. Lateral ties,  $1\frac{1}{4}$  inches. Panels, 7. Sway braces in 4 sets to bridge. Width over all, 13 feet 7 inches. Floor beams, 8 by 14 inches, about  $3\frac{1}{2}$  to the panel. No. 34, Howe deck.

No. 35, an iron deck truss, riveted in place. Like Nos. 30 and 43 in construction. See No. 43 for description. Floor beams, wood, etc. Foundations, stone. Span, 96 feet. Over Middlebury canal. Built by Kellogg & Maurice, of Athens, Pa., in 1881. No. 35, iron deck.

No. 36, an iron plate girder, over the Ohio canal. Span, 59 feet. Built in 1880, by Morse Bridge Co. No. 36, plate girder, over Ohio canal.

No. 37, a through iron Pratt Truss, over Wolf creek, of 95 feet span. Built by Kellogg & Maurice, in 1881. End post, two channels, 10 inches, and plate, 13 by  $\frac{5}{8}$  inches. Main end truss tie from top of end post, two,  $1\frac{1}{2}$  by 3 inches. Lower chord at middle, two,  $1\frac{5}{8}$  by 4 inches. Panels, 6. Depth of truss, 24 feet. Floor beams, 30 inches deep, with web plate  $\frac{1}{8}$ -inch thick, two angles at each edge, 5 by 5 by  $\frac{5}{8}$  inches, and a 10 by  $\frac{1}{2}$ -inch plate, laid on the middle portion. Beams riveted to No. 37, iron Pratt, over Wolf creek.

columns, and serve as struts to the bottom lateral system. Lateral ties, 2 inches. Top lateral ties,  $1\frac{1}{2}$  inches, and struts, two angle bars combined. The stringers are built of web and flange plates, similarly as the floor beams of a 24-inch web plate, and two, 10-inch flange plates and angle bars. Bearers are 5 by 15-inch I-beams, both riveted to floor beams. Masonry good.

Nos. 38, 39, 41  
and 58.

Nos. 38, 39, 41 and 58, all exact duplicates of 37, each of 95 feet span, 24 feet depth of truss between pins, and 6 panels. 38 over Styx river, 39 over Chippewa river, all built by Kellogg & Maurice in 1881. Masonry foundations.

No. 40, thro'gh  
plate girder.

No. 40, a through plate girder of 60 feet span, out to out, and 6 feet depth of truss. Over the Killbuck river. By Kellogg & Maurice in 1881. Girders with 12-inch flanges, and 5 or 6 by  $\frac{5}{8}$ -inch angle bars. At middle the flanges are  $\frac{3}{4}$  by  $\frac{3}{4}$  by  $\frac{7}{16}$  by 12 inches = about 27 square inches. Web stays of vertical angle bar, 3 by 4 inches, and a 3-inch plate under bar, 9 to the girder. Floor beams, 22 inches deep; web,  $\frac{1}{2}$ -inch, with flanges at end of 2 angle bars riveted on, 6 by 4, or 6 by  $\frac{5}{8}$  inches thick. At middle probably plate laid on. Gusset or angle plate at ends to top flange of girders for sway staying; this plate 19 inches at beam. Four floor beams to bridge, and 5 panels of the lateral system, with floor beam struts, and  $1\frac{1}{2}$ -inch tie rods. Across end of bridge a channel bar, 6 by 2 inches, by  $\frac{1}{2}$ -inch thick. Lateral rods secured to girder at end, and to beams at intermediate points. Stringers, 5 by 15-inch I-beams. Bearers,  $4\frac{1}{2}$  by 10-inch I-beams. Floor beams riveted to girders. Masonry abutment.

No. 41, Kil-  
buck.

No. 41, see 37. Over Killbuck.

No. 42, Warren  
truss.

No. 42, an iron riveted Warren truss of peculiar construction, and very novel design. Span, 96 feet. Extreme depth, 12 feet. Riveted in place. A through bridge, by Kellogg and Maurice in 1881. Over the Killbuck. Five bays of top chord, and six of lower; at middle bay of top chord. Middle points have vertical web,  $\frac{3}{4}$  by 12 inches; 4 angle bars, about 3 by 4 by  $\frac{1}{2}$  inches thick, and 2 plates at top flange, 12 by  $\frac{1}{2}$ , and 12 by  $\frac{3}{8}$  inches. Lower chord at middle a vertical web,  $\frac{3}{4}$  by 12 inches, and 2 angle bars, about 3 by 4 by  $\frac{1}{2}$  inches, and flange plate, 12 by  $\frac{1}{2}$  inches at bottom. No flange at top edge nor angle bars. Whole of chords same construction, but lighter near ends. End posts inclined, same as main web members, about  $45^\circ$ , and made like top chord. First main tie, from top of the end post, inclined at about  $45^\circ$ , and a web of  $\frac{3}{4}$  by 20 inches. Next web member of truss, a strut, inclined also at about  $45^\circ$ , but in opposite direction, 8 by 10 inches, outside; made of 2 channels, 10 by 3 by  $\frac{3}{8}$  inches, a plate, 8 by  $\frac{3}{8}$  inches, and slats opposite. The next member is inclined at about  $45^\circ$ , but opposite to the last, and made of a web plate,  $\frac{3}{4}$  by 14 inches, with  $2\frac{1}{2}$  by  $\frac{1}{16}$ -inch angle bars riveted on one edge. The angle bars are to stiffen the member to make it serve as a counter brace as well as tie. This construction makes the whole truss a sort of trellis or Warren's truss, in outline with triangular panels. The lower triangular panels have vertical ties for carrying floor beams at the middles of bottom chord bays. These vertical ties are 24 inches wide at base where joining floor beams, and serve as sway stays to top chord. These verticals are made of 24 by  $\frac{1}{2}$ -inch webs; two angles,  $1\frac{1}{2}$  inches, at one edge, and four, 3 by  $\frac{3}{8}$ -inch angles at the other edge of

web; the latter four forming on edge of plate a sort of an open column, with thimbles filling pieces. The same is at each mid-panel floor beam. Floor beams are also at the panel points, there being 12 in the bridge. The bridge is, however, a skew, making 12 instead of 11 floor beams necessary. Floor beams are 30 inches deep; plate,  $\frac{5}{16}$ -inch thick; flanges, 4 angles, 5 by 5 by  $\frac{9}{16}$  inches, and probably with plates laid on at middle post. With these as struts the lateral ties are 1  $\frac{3}{8}$  inches diameter. Stringers, two, 4 by 9-inch I-beams, and bearers the same. Flooring standard. Cost of the bridge per foot, \$42. Others like it, \$35. The riveted connections for holding the  $\frac{3}{4}$ -inch main ties and chords are by aid of plates laid on both sides, thus furnishing double shear rivets. The tension members are riveted so as to present only one hole first, two next, three next, etc., so as to reduce the effective section by the amount of only one rivet hole. The bridge is remarkable for its peculiarity and strength of design.

No. 43, same as 30 and 35; a deck iron truss with riveted connections; by Kellogg & Maurice. Over the Killbuck. Built in 1881. This structure has its members all made in very nearly the same way as No. 42, and riveted together in the same way. It differs in form of trussing in having all the struts vertical, even the end post, and by the introduction of counter ties in a few of the intermediate panels. The first main truss tie is a plate, 22  $\frac{1}{2}$  by  $\frac{3}{4}$  inches. The floor beams are 20 inches deep, by 10-inch flanges; latter of angle bars,  $\frac{5}{8}$ -inch thick. They are riveted to the vertical columns of trusses at such height, that tops of stringers come on a level with top chords of trusses. Stringers rest on top of floor beams, and consist of 5 by 15-inch I-beams; bearers, two, 10-inch I-beams; upper lateral ties, 1  $\frac{3}{8}$  inches; sway ties, 1 inch, at each panel; panels, 8; end sway ties, 1  $\frac{3}{8}$  inches. Span, 96 feet; depth of truss, 12 feet. Flooring standard.

No. 44, an iron plate girder of 60 feet span, same as No. 40, which see, Over L. Killbuck.

No. 45, a through Pratt truss, of 140 feet span, 24 feet depth, pin to pin, 8 panels, and 16 feet 6 inches width c. to c. End posts of two channels, 2  $\frac{3}{8}$  by 12 by  $\frac{1}{2}$ -inch web, and 15-inch plate. Lower chords at middle, four, 1  $\frac{1}{2}$  by 5 inches. End main truss ties, two, 1  $\frac{3}{4}$  by 4 inches. Floor beams, 32 by  $\frac{3}{8}$ -inch web plate; four angle bars,  $\frac{5}{8}$  by about 4 by 4 inches; and flange plate, 10 by  $\frac{5}{8}$  inches, riveted to truss columns. Lateral ties at end, 2  $\frac{1}{2}$  inches; middle, 1  $\frac{1}{2}$ -inch rods. Top laterals, 1 inch. Guard rails, 5 by 6 inches. By Kellogg & Maurice. Over the Jerome Fork.

No. 46, a deck plate girder, like No. 40. Span, 60 feet. Over Ritter's Run. Sway ties, 1 inch; laterals, 1  $\frac{1}{2}$  inches, at end and in 8 panels. Ties, 12 feet long, and notched on chords of girders. Guard rails of wood at ends of ties. By Morse Bridge Co. in 1881.

Mile-posts, stone, with the figures cut in, the full and half miles Ashland. Mile-posts.

No. 47, a through parabolic plate girder, same as No. 33. Span, 64 feet. Upper chord a channel bar, 3 by 12 by  $\frac{1}{2}$ -inch web; angle bars between chords and main girder web. Lateral ties at end, 1  $\frac{1}{2}$  inches. Over Crawford run. Built by Morse Bridge Co. in 1880. Stone foundations.

No. 48, same as No. 45. Over the Black Fork. End laterals, 2  $\frac{1}{2}$ -inch rods. No. 48, Black Fork.

No. 43, deck iron truss.

No. 44, iron plate girder.

No. 45, through Pratt.

No. 46, deck plate girder.

No. 47, parabolic plate girder.

No. 48, Black Fork.

No. 49, thro'gh  
plate girder.

No. 49, a through plate girder, 64 feet long, by 6 feet depth. Flanges, 15 inches wide, and  $1\frac{1}{2}$  inches in middle of top, besides the two 3 by 4 by about  $\frac{1}{2}$ -inch angles. Bottom at middle,  $1\frac{1}{2}$  by 15 inches + angles, two, 3 by 4 by about  $\frac{1}{2}$  inches. Floor beams,  $4\frac{1}{2}$  by 10-inch I-beams, 5 to the panel, riveted to and resting on upper flange of a channel bar, placed edgewise, and used in place of the usual angle at lower web of girder. Panel bearers have an angle plate for sway stays. Stringers, wood, two, 6 by 12 inches. Bearers, one, 6 by 12 inches. Ties, 4 by 9 inches, flat, and 3 inches between. Over Rocky Fork. By the Keystone Bridge Co., 1872. Stone foundations.

No. 50, a  
through Howe  
truss.

No. 50, a through Howe Truss, of wood, at Mansfield, O. Speed slow. Age 4 years. Lower chords, 5, 5, 5 by 14 inches. Iron clamps and keys to lower chord. Total depth of truss,  $10\frac{1}{2}$  feet. Panels, 8. End panel braces, two, 8 by 8 inches; ties, four,  $1\frac{1}{2}$  inches. Sway tie rods from top chord to post of floor beams, and crossing in plane of trusses. Floor beams, 4 per panel. Stringers, two, 5 by 14 inches. Bearers, one, 5 by 14 inches. Lateral tie rods,  $1\frac{1}{2}$  inches. Ties, 4 by 9 inches, flat, 12 inches between. Length, 64 feet. Over Rocky Fork. Stone abutment.

No. 51, thro'gh  
plate girder.

No. 51, a through plate girder; nearly like Nos. 40 and 44. 60 feet span, 6 feet depth. Upper chord, about 29 square inches in section; lower, about 25 square inches. Floor beams, 24 inches deep, by 12 inches, flanges over both. Lateral ties,  $1\frac{3}{8}$ -inch rods. Five panels to lateral system. Ties, 6 by 9 inches, flat, 12 inches c. to c. Abutments stone. Built by Kellogg & Maurice in 1881. Over the Whetstone creek.

No. 52.

No. 52, same as No. 45, which see. Built in 1881 by Kellogg & Maurice. Over south branch of the Little Whetstone.

No. 53, thro'gh  
iron truss.

No. 53, a through iron truss of 70 feet span, 6 feet 2 inches depth of truss, and built with same form of members as Nos. 42 and 43, and same style of trussing, if the first half triangular panel of No. 42 were added to the end of No. 43. Same pattern as No. 68, which see. Lower chord with 6 bays. Section of lower chord at middle, about 21 square inches. Upper chord section at middle, about 29 square inches. End post section, about 25 square inches. First main truss tie,  $\frac{3}{4}$  by 12-inch plate. Floor beams and sway angle plate as in plate girder No. 40. Lower edge of beam, 12 inches, above bottom of lower chords. Laterals, floor beams, and  $1\frac{1}{2}$ -inch rods. Flooring standard. By Kellogg & Maurice, in 1881. Over the Little Scioto. Abutments of stone masonry.

No. 54, thro'gh  
Howe truss.

No. 54, a through Howe truss of 64 feet span, 8 panels, and 11 feet depth of truss. 9 years old. Over the Little Scioto. Lower chords,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$ ,  $5\frac{1}{2}$  by 14 inches. End panel main braces,  $8\frac{1}{2}$  by  $7\frac{1}{2}$  inches. Counters, 8 by  $6\frac{1}{2}$  inches. Main end truss tie, two,  $1\frac{1}{2}$  inches. Clamps and keys iron. Stringers, 10 by 12 inches. Ties, 4 by 8 inches, flat, and 3 inches between. Floor beams, 7 by 16 inches, and 3 to the panel. Masonry abutments. Over the Little Scioto. Apparently a good bridge yet.

No. 55, thro'gh  
Howe truss.

No. 55, a through Howe, uncovered truss of wood, of 160 feet, about 22 feet depth of truss. Lower chords,  $6\frac{1}{2}$ , 8, 8,  $6\frac{1}{2}$  by 16 inches. Clamps and keys iron. End panel braces, 10 by 12 inches; and tie rods, three 2 inches, and two,  $1\frac{1}{2}$  inches. Four independent arches put in one year after bridge was built. These spring from iron skew-backs on abutments about 6 feet down. Arches strong, and support bridge by suspending



rods. Floor beams, 7 by 17 inches, 5 to the panel. Four of the iron angle blocks to main braces broken. Three or four floor beams rather badly decayed. Stringers somewhat decayed. Bridge built in 1871. Over the Big Scioto river.

West approach, a trussed girder over a street, about 30 feet long. Main stringers, two, 6 by 16 inches, and two, 7 by 16 inches, pine sticks. Truss rods, three,  $1\frac{3}{8}$  inches, drawing against wood corner blocks at ends and top of chord, and passing under 6 by 12-inch oak blocks, edgewise at the thirds of span.

East span, a trussed girder like at west approach.

Ties over all, 4 by 9 inches, and 3 inches between, and otherwise standard. Stone foundations.

No. 56, a through iron Pratt Truss of 92 feet span, 22 feet depth of truss. 6 panels. Lower chord at middle, four,  $1\frac{3}{8}$  by  $3\frac{1}{2}$  inches. End main truss tie, two, 1 by  $3\frac{1}{2}$  inches. Floor beams, 30 feet deep with  $\frac{5}{16}$ -inch web. Also, 10-inch flanges of angle irons through, and a  $\frac{5}{8}$  by 12 inch plate along the middle portion. Laterals,  $\frac{1}{2}$  by 10 inches, flat, with small angle bars on edges. Ties and flooring, standard. By Cleveland Bridge Co., in 1881. Fulton creek. No. 56, thro'gh iron Pratt.

No. 57, a through Howe Truss of wood, not covered, built in 1873. Over Bokes creek. Lower chords, 6,  $7\frac{1}{2}$ ,  $7\frac{1}{2}$ , 6 by 14 inches, with iron clamps and keys. End braces, 10 by 11 inches. Ties, three, 2 inches. Floor beams, 7 by 16 inches, and flooring, standard. Span, 160 feet, and depth about 22 feet. The chord bolts need screwing up, to hold the clamps and keys snug. Evidence of strain in lower chords, some joints opening slightly in lower chord. No. 57, thro'gh Howe.

No. 58, a through Pratt Truss of 95 feet span; 24 feet depth of truss, and with construction and dimensions as in No. 37. By Kellogg & Maurice, in 1881. Over Mill creek. No. 58, thro'gh Pratt.

No. 59, a through Pratt Truss like No. 45, which see. By Kellogg & Maurice, in 1881. Over Darby creek. No. 59, thro'gh Pratt.

No. 60, a through Howe, covered, over Spain's Run. Built in 1870. Foundations, stone masonry. Lower chord, 6, 7, 7, 6 by 14 inches. End main braces, two,  $7\frac{3}{4}$  by 11 inches. Lateral ties,  $1\frac{3}{8}$  inches. Floor beams, 6 by 14 inches, 5 to the panel. Stringers, 10 by 12 inches, and beares, 5 by 12 inches. Span, 100 feet. Panels, 10 feet. Bridge appears in not first class condition. Locks to chord clamps crushing at some splices. A trestle bent under at one of the thirds desirable. No. 60, thro'gh Howe.

No. 61, same as No. 56, except this is a skew. A through Pratt Truss of 94 feet span, and 24 feet depth, and standard flooring. By the Cleveland Bridge & Car Works, in 1881. Over the Spain's Run. Stone masonry foundations. No. 61.

Nos. 62 and 64, through Howe Trusses of 100 feet span, covered. Over Spain's creek and King's Run. Built in 1866 and 1868. Parts of usual sizes. No. 62 apparently failing. A clamp of lower chord in middle of south truss, broken at lower edge. Other clamps not kept up close by the chord bolts. Some locks of clamps crushing. One clamp has toad stools growing on it. Bored with a bit and found wood decayed inside. Bridge in bad condition, and needs a trestle bent under it. No. 64 appears to be sound and doing its work well, with the exception of the break at lower edge of one clamp at west end. This defect is where it does the least harm. Masonry foundations. Nos. 62 and 64, thro'gh Howe.

No. 63, half  
Howe. No. 63, Howe half truss; old. A plate girder ordered for replacing it. Over King's Run.

No. 65, Mad  
river. No. 65, a new iron bridge going in. Mad river.

No. 66. No. 66, bridge like No. 65 going in. Mad river.

No. 67, Pratt. No. 67, a new Pratt Truss going up. Mad Run. Nos. 65, 66 and 67 are by the Morse Bridge Co.

No. 68. No. 68, a through iron truss with riveted connections of same pattern as No. 53, but larger. Span, 96 feet. Depth of truss, 10 feet. Seven panels. Over Mad Run. Built by the Cleveland Bridge and Car Works in 1881. Masonry abutments.

Members of the trusses in the same form as in Nos. 42 and 43. Tie bars inclined at 45 degrees, or perhaps flatter. Struts are vertical. Diagram of truss like the Pratt, but the details are radically different from those found in the style usually known as Pratt's.

End post inclined toward midspan, at same angle as the ties are inclined from it. Section of end post like I-beam, having a web plate,  $\frac{3}{8}$  by 12 inches, with flanges at one edge of a  $\frac{1}{4}$  by 12-inch, and two, 3 by 3 by about  $\frac{3}{8}$ -inch angles, riveted, and with flanges at other edge of web, two angles 3 by 3 by  $\frac{3}{8}$  inches, and two, 3 by about  $\frac{1}{2}$ -inch plates under angles, with rivets through angles, plates and edge of web plate, thus making flanges each way  $7\frac{1}{2}$  inches over all. Lower chord at middle T-section, inverted web;  $\frac{3}{4}$  by 12 inches. The T-flange plate,  $\frac{3}{8}$  by 12 inches, and two,  $3\frac{1}{2}$  by about  $\frac{1}{2}$ -inch angles. Truss ties, simple plates,  $\frac{3}{4}$  by 14 inches, at end post; next,  $\frac{3}{4}$  by 9 inches, and  $\frac{3}{8}$  by 7 inches at middle panel. In next panel it is a counter tie,  $\frac{3}{8}$  by 5 inches, and the last. The first vertical is simply a tie or suspender as in Pratt's Truss, riveted to the first floor beam. Next vertical is a plate, rising from the floor beam to which it is riveted and where it is 22 feet wide in line of floor beam, to the top of truss where it is about 6 feet wide, thus serving as a sway stay to truss. The outside edge is in the plane of the truss and made to serve as a column by four 3 by 3-inch angles, being riveted on in cruciform section at edge of the angle or sway plate. Opposite edge of the plate has two, 2 by 2-inch angles riveted on, forming flanges  $4\frac{1}{2}$  inches over all. In the truss all the members are so joined that the neutral axes of all members at a common junction intersect at one point. Rivet in double shear for tension members, with one at first, then farther back, two, etc. Rivets allowed 7,000 maximum shear per square inch. Tension members, 10,000 lbs. maximum tension. Lateral system, floor beam struts and ties. Ties at end,  $1\frac{1}{2}$  inches square. The cast of these riveted connection bridges is stated to be about the same as for pin connection bridges. This style adopted here, it is said, for the difficulty of getting exact lengths and uniform bearings in pin connections. Flooring on bridge, standard.

No. 69, thro'gh  
iron Pratt. No. 69, a through iron Pratt truss; by Kellogg & Maurice in 1881. Over Mad river. Similar to Nos. 59 and 70. Masonry abutments. Two spans, of 160 feet each; and depth of truss, 24 feet. End posts, two, channels, 3 by 12 inches by  $\frac{5}{8}$ -inch thickness of web; 1 plate, 15 by  $\frac{3}{8}$  inches, and slats. Panels, 10. Lower chords at middle, six, 1 by 5-inch bars. Main end truss ties, two,  $1\frac{1}{2}$  by 5 inches. Stringers, 24 by  $\frac{3}{8}$ -inch web, with 4 angles, 5 by 5 by  $\frac{5}{16}$  inches, to form flanges. Floor beams like No. 70, with hangers made  $\square$  of  $1\frac{1}{8}$ -inch square iron. Lateral struts



one angle,  $3\frac{1}{2}$  by  $3\frac{1}{2}$  by about  $\frac{3}{8}$  inches, and a  $\frac{1}{2}$  by 6-inch plate, riveted Warren system; see No. 70. The columns are here riveted to top chord, and with pin bearing at bottom. Fixed to central pier with expansion rollers under the abutment ends.

No. 70, a 2-span iron Pratt, similar to No. 69. Spans, each 145 feet; depth of truss, 24 feet. Same age, and make as No. 69. Over Mad river. No. 70, iron Pratt.

End posts, two, channels, 3 by 12 by  $\frac{1}{2}$  inches; 1 plate,  $\frac{5}{16}$  by 15 inches, and slats. Panels, 9. Lower chords at middle, four,  $1\frac{5}{16}$  by 5-inch eye bars. End main truss ties, two,  $\frac{5}{16}$  by 5 inches. Top chord like end post. Lateral system after Warren's, with the floor beams at a slight angle, and struts at greater angle, both serving as tie or strut. The strut-tie between floor beams at end, one,  $\frac{1}{2}$  by 5-inch plate, with an angle, 3 by  $2\frac{1}{2}$  by  $\frac{3}{8}$  inches, riveted on under to stiffen it. Floor beams suspended by inverted U of  $1\frac{1}{4}$  inches square over the  $3\frac{1}{4}$ -inch pins. Floor beams, 31 inches deep, and 4 angles, 5 by 5 by  $\frac{9}{16}$  inches, riveted to web-plate of  $\frac{5}{16}$  by 31 inches. In middle portion a plate,  $\frac{1}{2}$  by 12 inches, is laid on the angle iron flanges. Truss columns of two, channels and slats crossing. Stringers, etc., as in No. 69. Top laterals in Warren's system, of  $3\frac{1}{2}$  by  $3\frac{1}{2}$  by  $\frac{5}{8}$  inches thick at ends, and  $\frac{3}{8}$ -inch thick at middle of span. Trusses tied together at pier, and on expansion rollers at abutment ends.

No. 71, two spans of plate girder, nearly ready to put. By the Morse Bridge Co. Over the Miami canal. No. 71, plate girder, Miami canal.

#### GENERAL REMARKS.

The rails throughout this road are mostly steel; the standard being 60 lbs. per yard, with angle bar suspension joints. Rails are laid with opposite joints respecting both rails, except on curves, where they are allowed to have their run till the farther tangent is reached, when a rail is cut to bring joints opposite again. Rails.

The Wharton switch is objected to for the rise in the elevating rail, where speed may be considerable. The Lorenz switch is much used. Wharton switch.

The elevation of the outer rail on curves is here made equal the versed sine to a chord of 45 feet length. This is regarded as a suitable mean between the standard speed, 30 miles per hour, of passenger trains, and the 15 miles per hour of freight trains. Elevation of outer rail.

The standard flooring for bridges consists of ties, which are 6 by 9 inches, and laid 12 inches, center to center, where the bridge has a straight track, but for a curved track the ties are 7 by 9 inches, and beveled, or notched at one string to give the cant. Also bearers at ends of ties with wood guard rails, about 5 by 6 inches, lying flat, notched on ties, and bolted at frequent intervals. Placed about 12 inches out from the track rails. If these figures vary a little in a particular case, the flooring is regarded as about equivalent to standard. Flooring.

The heaviest locomotives in use here are the consolidation of about 80 tons weight, including tenders, when standing on track ready for service. Locomotives.

The mile-posts and half mile-posts are stone, with figures cut for miles, etc. Also  $\frac{1}{4}$  mile-posts are set. The roadway is all in fine condition. The smoothness with which the train is carried, indicates close Mile-posts.

attention to ballast tamping, rail joint fastenings, and matters belonging to section men.

**Baker Car  
Warmer.**

The Baker Car Warmer is now put on all new cars as made. This consists in the main of a boiler or heater, with fire and water compartments, from the latter of which pipes go to remote parts of the car. To lessen the danger of freezing, when standing by, or steam when heating, the water has a quantity of common salt in solution, which lowers the freezing point, and raises the boiling point. In case of accident the heater is expected to give but little danger of fire, from the fact that the fire is surrounded by the water, and will be likely to be extinguished if the heater should become broken or smashed.

**Wooden struc-  
tures.**

The structures of the road are for the most part in an exceedingly fine condition. The great number of new iron bridges are all first class, and up to the modern heavy rolling loads. Many of these bridges are of exceedingly novel design, and appear to be the very embodiment of strength and solidity. They are a credit, not only to the road and its chief engineer, who accepted them, but to their accomplished bridge engineer and designer, Gustav Lindenthal, of Pittsburgh.

**Iron bridges.**

The great number of iron bridges, viz., 30, which have been erected this year in Ohio by this company, argues the speedy substitution of iron for the few remaining wooden bridges, which were found somewhat out of condition. For qualities of iron in these new bridges see the article *Railroad Economics* of this Report. Qualities of iron in other bridges cannot be given.

## REPORT OF LIEUT. GEORGE RUHLEN, U. S. A.

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HON. H. SABINE, *Com'r of Railroads and Telegraphs, Columbus, O. :*

SIR: I have the honor to transmit to you herewith a report of observations made, and information collected during a tour of inspection, by your appointment and in accordance with instructions received from your office, under date of June 23, 1881.

Owing to the extent of ground to be covered, it was in many instances impracticable to make more than a preliminary examination—a reconnoissance, as it were—of the field before me, to ascertain the location, nature and extent of the work necessary to be accomplished in the direction indicated by your letter of instructions, and to collect data on the subject which would serve as a basis and starting point for future investigators. I passed in the course of my inspection over more than eighteen hundred miles of the railroads of Ohio, and made a personal examination of every important bridge and trestle-work found on the lines assigned to me for inspection. Believing that your injunction “to take note of and report any serious fault in the condition or construction of any road that indicated the same to be unsafe and dangerous for the transportation of passengers,” embodied the primary and principal motive which actuated you in causing the inspection to be undertaken, I shaped my course accordingly. In order to accomplish this leading object, I was constrained in some instances to neglect other considerations, which more time and opportunity would have enabled me to treat with the attention due to their importance. I refer here more particularly to the physical characteristics of the railroads of the State other than bridges and trestles, such, for example, as side and switching tracks, station houses, platforms, signal and telegraph apparatus, rolling stock, with reference to its appliances for safety and comfort of train employes and passengers, machine and repair shops, and other things of this nature, a knowledge of all of which is necessary as a basis on which to form a correct judgement of the management and standing of a railroad.

In compliance with your request, a report was made at once of any case which came under my observation, where it was deemed necessary that a due regard for the safety of train men and passengers required that immediate attention should be directed to the correction of specific faults. Many such cases of serious faults in plan of construction, or of failure from decay, overstraining or accident in bridges and trestles were pointed out and reported to you in writing. In some instances, where these reports were made, I had subsequent opportunity to observe that the recommendation and suggestions made for remedying the errors indicated were promptly carried out. Not having been able to revisit all the places where suggestions for repairs were made, I cannot, from personal knowledge, state that the recommendations made were followed in every instance.

Measurements of the principal parts of all important structures were made and noted, both from the structures themselves, and in some cases from the maker's drawings and specifications. These are being arranged and tabulated as far as car-

ried, and will also be transmitted for file in your office. This was done, however, only in case of structures of a permanent nature, which, from their situation and condition, were not marked for early renewal, and where the element of deterioration from age and decay had not rendered useless the applications of rules and formulas given by engineers for determination of their strength.

In confining myself to what I deemed to be the most necessary part of the work entrusted to me, much which would have added to the interest of this report is wanting. As it now stands, I venture to hope that this, together with the statistical tabulations, as to location, size, style and condition of such railroad bridges as are referred to in my report, will save some future investigator the time which I was obliged to devote to these necessary preliminaries of a thorough examination. A few companies furnished statements, containing descriptions more or less minute, of bridges and trestles on their lines, but in the majority of cases the only information attainable was a bare statement, found in the last report of the Commissioner of Railroads, that on a certain line of road were a given number of stone, iron, or wooden bridges, whose aggregate length was so many thousand feet, and greatest age, so many years.

Every desired facility was furnished by the railroad companies for making this inspection, and whenever it was possible for them to do so, officers connected with the management and construction departments of the road accompanied me. No attempt at concealment of any deficiency or evasion of responsibility therefor was met with anywhere. The personnel of the railroads that came under my observation, I found to be composed of gentlemen of great activity, and of a high order of intellectual and business capacity. Although coming in contact with railroad men of all grades of service during my tour of inspection, I did not observe a single instance of rudeness or vulgarity toward subordinates, or of want of proper respect and obedience to the directions of those holding positions of higher responsibility; neither did I at any time see any person, connected with or employed by a railroad corporation, and holding a position above the grade of ordinary laborer, under the influence of intoxicating liquor to such an extent as to make his condition apparent, or to incapacitate him from properly performing his duty. I do not assert that all the railroad men with whom I came in contact are free from these faults and vices, but do assert, that with abundant opportunity for their detection, if present, I failed to observe any. From the very nature of the work in which they are engaged, and the necessities of the circumstances surrounding them, thousands of young men in the employ of railroad corporations are receiving a systematic training in habits of promptness, obedience to established rules, physical endurance, quickness of perception and self-reliance in emergencies which they could not elsewhere obtain. In this respect railroads are certainly useful educators and trainers, and for aught we know may be performing to some extent the function of the drill-master in the most important element of a soldier's education—system and obedience—for a large portion of what in an emergency would constitute the defenders of the country.

I am, sir, very respectfully,

GEORGE RUHLEN,  
1st Lieut. 17th U. S. Infantry.

## GENERAL OUTLINE.

- I. LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY.
  1. Main Line, from Conneaut westward, via Northern Division to West State Line.
  2. Southern Branch, from Elyria to Toledo.
  3. Mahoning Coal Railroad, from Ashtabula to Youngstown.
- II. PAINESVILLE AND YOUNGSTOWN RAILWAY, from Fairport, on Lake Erie, to Youngstown.
- III. OHIO CENTRAL RAILROAD, from Toledo to Bush's Station, and thence to Columbus.
- IV. CLEVELAND, PAINESVILLE AND ASHTABULA RAILWAY, from Becker Ave., Cleveland, to Euclid.
- V. CHAGRIN FALLS AND SOUTHERN RAILROAD, from Solon to Chagrin Falls.
- VI. ALLIANCE AND LAKE ERIE RAILROAD, from Alliance to Phalanx.
- VII. COLUMBUS, MT. VERNON AND DELAWARE RAILROAD, from Hudson via Akron to Columbus.
- VIII. CLEVELAND AND MARIETTA RAILROAD, from Marietta to Canal Dover.
- IX. LAKE ERIE AND WESTERN RAILWAY, from Sandusky to Fort Recovery, near State Line.
- X. CONNOTTON VALLEY RAILWAY, from Dell Roy to Cleveland.
- XI. VALLEY RAILWAY, from Cleveland via Akron to Canton.
- XII. CLEVELAND, COLUMBUS, CINCINNATI AND INDIANAPOLIS RAILWAY.
  1. From Cleveland to Columbus.
  2. "Cincinnati Division," Delaware to Dayton.
  3. "Indianapolis Division," from Union City to Gallon.
- XIII. EASTERN OHIO RAILROAD, from Point Pleasant to Cumberland.
- XIV. COLUMBUS AND HOCKING VALLEY, from Columbus, O., to Athens, O., including Straitsville and Monday Creek Branches.
- XV. COLUMBUS AND TOLEDO, from Columbus to Toledo.
- XVI. OHIO AND WEST VIRGINIA, from Logan to Pomeroy, Ohio.

## I. THE LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY.

From Conneaut, O., to Edgerton, O., with one branch from Elyria via Sandusky to a point eight miles east of Toledo, and another from Elyria via Fremont, Clyde, etc., to same point. The road in Ohio is double track from Elyria to Conneaut. In this inspection was also included the branch from Ashtabula to Youngstown. The inspection was made July 6, 7 and 8 by the entire commission of railroad inspectors, accompanied by the Railroad Commissioner of the State, and by officers of the road who have in charge the permanent way and structures. The unusual facilities thus afforded enabled us to gain an insight, not only into the physical condition of the road, but also into many features of its management.

## GENERAL NOTES.

## Personnel.

Without attempting here to enumerate all the detailed information obtained from trustworthy sources and from personal observation, I do not hesitate to state that the high reputation of this railroad is well deserved, and based on substantial merits. The closer the inspection, the more evident this fact appears. The ruling principles, successfully applied in this road, appear to me to be division of labor and unity of interest and responsibility; thorough discipline among its personnel and the highest order of intelligence and experience attainable on the part of those having direction of the affairs of its various departments, and furthermore, a constant endeavor to keep apace with scientific progress and invention in its field of operations without hindrance from narrow prejudices on the one hand, or impractical notions on the other. There may be railroads in Ohio equally well directed, managed and equipped, but this does not detract from what is here stated of the Lake Shore.

## Road-bed.

The road-bed is solid, well embanked, and drained, but the right-of-way not as neatly kept as is the case with some other roads. Fences, as a rule, were well kept up—the exceptions noted being in places where the ravages of recent fires had not been repaired. Ties were heavy; in very good condition, well bedded in ballast, which as a rule is gravel although stone and furnace cinders are found in places. The rail is a sixty and sixty-five pound steel, with angle bar joints and several devices of lock-nut washers.

## Bridges and trestles.

In bridges and trestles the tendency is to rebuild or renew the former with permanent structures of iron truss and girder, or stone arch, and in case of the latter to fill up with solid embankment where practicable. Statistics were shown which proved that this work was carried on at the rate of one mile of trestle per year being filled with earth. The most extensive work of this nature was the renewal and filling with broken stone of the pile trestle through Sandusky Bay, and renewal and filling of a long wooden trestle near Jefferson on the Youngstown branch.

## Block-system.

This is the only road in, or running through Ohio, which at this date runs its passenger and a portion of its freight trains on the block system—the only system that, when strictly followed, must absolutely prevent collisions, and which, with the addition of proper interlocking devices, must result in entire security in spite of carelessness or negligence on the part of employes. With interlocking machinery careless

employes can only cause delay and inconvenience in running trains, without it even, by the block-system the lives of passengers are still to some extent at their mercy.

1. Main Line, from Conneaut westward via the northern division to State line.

The most prominent bridges in Ohio on this line of road are the following:

At Conneaut, a fine substantial stone bridge containing two arches, each 66 feet in diameter, built in 1869 and 1870. Masonry first-class, and entire structure in good condition. Conneaut, stone bridge.

At Ashtabula an enormously strong Pratt truss iron deck bridge, double track, 158 feet span, and about 70 feet above water level of river. The approaches on each end are by a stone arch. There are outer wooden 7 by 8 inches and inner railroad iron guard rails, also a 7 by 8-inch wooden rail, separating the two tracks. Ties are 7 by 8 inches, laid 5 inches apart. This bridge is so strongly and substantially built that it scarcely requires analytical calculations to demonstrate the fact of its superabundant strength. Although not deemed necessary here, details of all its parts were obtained, and are on file. Ashtabula, Pratt truss.

Over the Grand river at Painesville there is a fine four-arch stone bridge, built in 1857. Arches, 80 feet in diameter. Painesville, Grand river, stone bridge.

At Willoughby, over the Chagrin river, is a double track, two-span Post Truss iron deck bridge, 165½ feet long, resting on first class stone masonry abutments. It contains two outside and one center truss, the latter being put in for additional strength in 1877. Willoughby, Chagrin river, Post Truss.

Over the Cuyahoga river at Cleveland, there is an iron swing bridge, 308 feet long, which is operated by means of steam power, from the west bank of the river. Detailed measurements of the parts of this bridge are on file. This was built by the Keystone Bridge Co., in 1867. Cleveland, Cuyahoga riv., iron swing bridge.

The next, going westward on the Toledo Division, is an askew, two-arch stone bridge, over Lake avenue, Cleveland, which contains the finest specimen of stone masonry and stone cutting that in bridge construction came under my observation. Cleveland, Lake avenue.

At Berea is another double track five-arch stone viaduct over Rock river, built in 1871. First class masonry, and in good preservation. Berea, stone viaduct.

At Olmsted Falls, over west branch of Rock river, there is a six-arch stone viaduct for double track; it was built in 1871. Olmsted Falls, Rock river, stone viaduct.

Over east branch of Black river, at Elyria, there is a two-arch stone viaduct for double track, built in 1872, and another five-arch double track stone viaduct over west branch of Black river, a short distance further on. Here the main line separates into two branches, both going as single track lines toward Toledo, one taking the direction along the lake shore through Sandusky, Port Clinton, etc., and the other, further south, through Monroeville, Clyde, Fremont, etc., both again uniting at Millbury, a station six miles east of Toledo. Elyria, Black river, stone viaduct.

At Vermillion, over Vermillion river, there is a single track, wooden Howe Truss deck bridge, 150 feet long, built in 1874; covered. The ties are 7 by 8 inches, track stringers, double, 6 by 12 inches. There is an outer guard rail of wood, and an inner one of railroad iron. The timbers throughout are strong, sound and substantial. Lower chord, 6, 7, Vermillion, Verm. river, Howe deck.



- 7, 6 by 14 inches, and main braces, double, 10 by 11 inches, at ends. Tie rods, three, each  $1\frac{1}{8}$  inches in diameter at end panels.
- Huron, Huron river, Howe draw.** Over Huron river, at Huron, there is a single track wooden Howe Truss draw bridge, 136 feet long, which was rebuilt in 1878.
- Sandusky bay, trestle.** Through Sandusky Bay the track passes over a pile trestle bridge, which, with the iron draw bridge and the intervals of broken stone filling, is 7,500 feet long. This is now being substantially rebuilt, and bents partly filled with stone. The iron draw spoken of above is a Post Truss, built in 1872. It rests on a stone center pier with pile foundations.
- Port Clinton, Howe draw.** The wooden Howe truss draw bridge at Port Clinton, 170 feet long, rests on pile abutments, with stone center pier resting on pile foundations. It is 170 feet long, contains 18 panels of unequal lengths, and has an arched or curved upper chord, also an outer wooden and inner railroad iron guard rail. Floor beams, 7 by 14 inches, suspended from lower chord. The upper laterals extend across the three center panels only.
- Toursaint and Packer creeks, iron girders.** At Toursaint creek and Packer creek are at the former two and at the latter one span iron girders, 40 feet long, which were built in 1880.
- Toledo, Maumee river, Pratt truss.** At Toledo, over the Maumee, is a magnificent iron three-span Pratt truss bridge, each span being 167 feet long, and also one-span draw-bridge, 190 feet long, all supported on stone masonry piers resting on pile foundation; all built in 1877.
- Short spans, west of Toledo.** From Toledo westward there are a number of short span iron girders, and one two-span deck iron Pratt truss bridge over the St. Joseph river at Edgerton. The latter is a new, strongly built structure, resting on good stone masonry abutments and center pier.
2. Southern Branch, from Elyria to Toledo.
- On the southern branch of the main line, from Elyria via Clyde, Fremont, etc., to Toledo, there are several important structures, which will be briefly referred to here.
- Wakeman, Vermillion river, stone viaduct.** The first of these, west from Elyria, is a single track, two-arch stone viaduct over Vermillion river at Wakeman, built in 1872. This is a magnificent specimen of engineering, from its natural rock foundations to the summit of its bold arches. It is an ideal of boldness, as the one at Conneaut is of massive strength. No figures giving dimensions can give a proper idea of the really imposing appearance of this structure, and the closest inspection reveals no sign of deterioration.
- Monroeville, Huron river, Post truss.** At Monroeville, over the west branch of Huron river, is a two-span Post patent iron bridge; each span being 106 feet long. This also contains three trusses, the center one being put in for additional security in 1877.
- Fremont, Sandusky river, Howe deck.** At Fremont, over Sandusky river, there is a two-span wooden Howe truss deck bridge; each span being 106 feet long. It was built in 1868, and is covered. The ties are 6 by 8 inches, four inches apart, and there is a wooden 6 by 8-inch outer and an inner railroad iron guard rail. Lower chords, 5,  $6\frac{1}{2}$ ,  $6\frac{1}{2}$ , 5 by 14 inches; end main braces, double,  $7\frac{1}{2}$  by 10 inches; tie rods, same panel, two, 2 inches, and one  $1\frac{1}{2}$  inches diameter.
- Muskalonga river, iron plate girder.** West of Fremont, over the Muskalonga river, there is a 44-foot span iron plate girder, resting on stone abutments, and built in 1880.
- Elmore, Portage river, Pratt truss.** The bridge over Portage river at Elmore is a two-span iron Pratt truss; each span being 105 feet. It was built in 1877.

### 3. Mahoning Coal Railroad, from Ashtabula to Youngstown.

From Ashtabula to Youngstown, under lease of the Lake Shore Railroad Company.

From Ashtabula southward, the first structure is a single track, Mill creek, Howe truss. single span wooden Howe truss bridge over Mill creek, between Plymouth and Jefferson. It is 130 feet long, and was built in 1880. Lower chords, 6, 7, 7, 6 by 14 inches. Ties, 6 by 7½ inches, 5 inches apart; guard rails, outer, 7 by 8 inches, wood, inner of railroad iron; main braces, double, 9 by 11 inches, outer pair; center counters, 7 by 8 inches; end tie rods, two, 1½ inches, and one, 1½ inches diameter. The bridge rests on pile bents. This bridge is covered.

At Jefferson there is a pile trestle bridge, originally built in 1872. Jefferson, pile trestle. It contains 29 spans of 12 feet each, and its maximum height is 40 feet. Bents are 12 feet from center to center, well braced, transversely and longitudinally. Bent timbers, plumb and batter posts and caps and sills are 12 by 12 inches. Track-stringers, double, 7 by 14 inches.

The trestle bridge between Jefferson and Dorset, 696 feet long, is like the one just described, but is at present undergoing reconstruction, Trestle between Jefferson and Dorset. being in part filled up and in part rebuilt with pile instead of framed bents.

Over Mills creek there is a 100-foot span Howe truss deck bridge, Mills creek, Howe deck. built of good sound timbers and usual dimensions of parts.

There are a number of trestles, similar in style of construction and Trestles. dimensions of parts to the trestle bridge at Jefferson above described, but older and not generally in as good condition. The age of these, four in number, ranging from 60 to 72 feet in length, is about eight years. They are being in part renewed, and some are being entirely filled up.

At a point near Kinsman, about 26 miles from Youngstown, there is a very old, through, single 100-foot span wooden 12-panel Howe truss Near Kinsman, through Howe. bridge. The timbers of this are to all appearance still sound and firm, but lighter in section than appears desirable for heavy traffic. The lower chord is 5, 6, 6, 5 by 14 inches; end main braces, 8 by 9 inches, double; end tie rods, two, 1½ inches, and one, 1½ inches diameter; center counters, 7 by 9 inches; depth of truss, 22 feet 6 inches. The exact age of this bridge could not be ascertained, but as estimated it exceeded twenty years, which, however, must be an error, since the original construction of the road dates only back to 1871.

## II. PAINESVILLE AND YOUNGSTOWN RAILWAY, from Fairport, on Lake Erie, to Youngstown.

This is a narrow gauge road, 61 miles in length. Inspected August 9, 1881.

From Fairport to a point 13 miles south, the road bed is that of the Road-bed. old Painesville and Hudson Railroad. It is here in good condition, as regards height of embankment, but is poorly ballasted. On other portions of the road the road bed is badly drained, flat, with side ditches entirely wanting, or so choked up with mud and debris, as to be of no service in carrying away the water. In consequence, where there are side cuts, the ties are sunk and almost submerged in the mud, which touches in places the lower surface of the rails.

Ballast.

The ballast throughout is thin and much worn.

Rail.

The rail is a light 32-pound iron, somewhat worn and battered, and by reason of the faults in the road bed already pointed out, not in good line or surface.

Trestle No. 1,  
Fairport.

Near Fairport harbor is a 17-span trestle, which is the north approach to a Howe truss draw bridge. It is a pile trestle, with bents 15 feet from center to center, each rail being supported by a single 12 by 12-inch stringer. The ties are new, 6 by 8 inches, well spaced and held in place by a 4 by 6-inch wooden guard rail, let into them to a depth of 1 inch and fastened down with iron spikes. The timbers in this structure are all in good condition, the whole work having been recently thoroughly overhauled.

Bridge No. 2,  
Howe truss  
draw.

Following this, going southward, and immediately adjoining it, is an old Howe truss draw bridge, containing 12 short panels, and resting on pile foundation. Its lower chords consist of three pieces, 4, 9, 4 by 10 inches. All its parts are old and decaying, and although examination disclosed no specific points of weakness or immediate danger, the whole structure has evidently outlived its usefulness in its present condition. Two iron angle blocks were found to be broken.

Bridge No. 3,  
Howe.

Following the above is a 12-panel Howe truss bridge, 106 feet long. The lower chords are 5, 6, 6, 5 by 13 inches; two end main braces, each 8 by 10 inches, and three end tie rods, each 1½ inches in diameter. Floor beams are 6 by 12 inches, four in each panel. Track stringers, double under each rail, 6 by 12 inches; cross ties, 6 by 8 inches, spaced 2 feet from center to center. There is no guard rail on any part of the bridge. The timbers of this structure throughout are in fair condition. A short trestle connects the south end of this bridge with the west bank of the river. I am informed by officers of the road that this branch, from Painesville to Fairport, is used only for freight traffic.

Bridge No. 4,  
trussed beam,  
near Painesville.

About two miles south of Painesville is a trussed beam 54 feet long, which forms the northern approach to the stone viaduct. The beam consists of two pieces of oak, 15 by 15 inches, laid one above the other, and trussed with two 2-inch rods. The cross ties on this are 6 by 8 inches, spaced 18 inches from center to center. There is an inner railroad iron guard rail, and an outer one of wood over this and the immediately adjacent,

Bridge No. 5,  
stone arch.

Four-arch stone viaduct, which is a fine structure and in an excellent state of preservation.

Trestles.

Between the above and Clark's station, are two short 3-span low trestles, from 25 to 35 feet long, whose timbers and ties are in good condition, but they have no guard rails.

Bridge No. 6,  
half truss  
(Howe), near  
Chardon.

Near Chardon is a low (or half) Howe truss bridge, containing eight panels, each being 6 feet 6 inches long. The floor beams are 6 by 14 inches, two in each panel. The lower chords, 5, 9, 5 by 12 inches. It rests on good stone abutments. The track stringers, on which the iron rail rests directly, *there being no cross ties, and consequently no guard rails*, are single 8 by 12-inch oak. Height of truss, 7 feet 8 inches. The only preventive against spreading of the track on this bridge that I could observe, was a slight hold of the track stringers upon the floor beams, they being let into the latter to a depth of from ¾ to 1 inch. The timbers of this bridge appear in good condition.

About 100 yards south of No. 5 is a 32-span trestle, whose bents are at an average distance of 12 feet from center to center. Track stringers are single, 10 by 12 inches; cross ties, 6 by 7 inches, spaced 18 inches from center to center. The trestle is on a slight, about  $1\frac{1}{2}$  degree, curve. It has no guard rail. The ground sills of the 4th, 5th, 9th and 10th bents from the north end, and the 11th and 12th from the south end are much decayed. The right post of the 7th bent from the south end is also decayed at the bottom. The officers of the road assured me that this entire structure would be overhauled in less than two weeks.

Bridge No. 7,  
trestle.

One mile north of Center road station is a low eight-panel Howe truss bridge, 50 feet long and resting on stone masonry abutments. In style of construction, dimensions of parts, etc., it is like the bridge No. 6, near Chardon, already described. It is apparently in good order, as regards condition of its timbers. Like its counterpart, it has neither cross ties nor guard rails.

Bridge No. 8,  
low Howe  
truss.

Near East Claridon is the Burton trestle, 700 feet long, bents from 11 to 12 feet from center to center. Track stringer, 10 by 12 inches, ties, 6 by 6 inches, spaced 22 inches from center to center. No specific dangerous points were observed on this structure, but it needs overhauling and repair. A portion of the timbers required for this purpose are already on the ground, and I am informed that workmen will commence on it in about two weeks.

Bridge No. 9,  
Burton trestle,  
near east  
Claridon.

Following this is the Middlefield trestle, 715 feet long, which has quite recently been completely overhauled and placed in good repair, all parts affected by decay being removed and replaced by new sound timber. Ties are also new, spaced 12 inches apart, and held in place by a 5 by 6-inch guard rail. In style of construction, dimensions of parts, etc., it is like similar structures of its class on this road, which have been before described.

Bridge No. 10,  
Middlefield  
trestle.

About one mile south of Middlefield are the two Swine creek trestles, each being about 200 feet long and 27 feet high. The ties are 6 by 8 inches, spaced 21 inches from center to center. The trestles are on a slight curve and have no guard rails. They are braced longitudinally by two sets of horizontal longitudinal 2 by 8-inch plates, extending from bent to bent. The timbers are in good condition, and dimensions like those in structures before described.

Bridges No. 11  
and 12, Swine  
creek, trestles.

Two miles south of Middlefield is a ten-panel Howe truss deck bridge, 100 feet long. The lower chords are 6, 9, 6 by 12 inches. Floor beams, 6 by 14 inches, spaced 26 inches from center to center. The track-stringers are 8 by 12 inches, let into floor beams one inch. There are no cross ties, nor guard rails. The truss is 17 feet high, and the lower chord nearly 20 feet above the ground. The bridge rests on stone abutments. As in other bridges of its kind on this road there is very little protection against a spreading of the track, and in case of derailment, nothing whatever to save cars from a fall of nearly forty feet. The sway braces are 6 by 8 inches, but they are at the ends only, and therefore nearly 100 feet apart. In the post panel at the north end the east lower chord is somewhat affected by decay. Aside from its faulty construction in regard to absence of cross ties and guard rail, the general condition of this bridge is unsatisfactory and unsafe.

Bridge No. 13,  
Howe truss  
deck.

Near Farmington, over Grand river, is a 14-panel Howe truss bridge, 144 feet long, resting on stone masonry abutments. Its track-stringers are 22 feet above the ground. Lower chords are 6, 9, 6 by 13 inches,

Bridge No. 14  
Howe truss,  
near Farming-  
ton.

and two end main braces, each 8 by 9 inches; two end tie rods, each 2 inches in diameter. The floor beams are 6 by 14 inches, four in each panel. Like the preceding bridge, No. 13, it has neither cross ties nor guard rails. The chord and other timbers of this bridge gave no indications of weakness or decay.

Bridge No. 15, near State road, Harrington trestle. The Harrington trestle, near State Road Station, is 615 feet long. In this the track-stringers have been overhauled and all found defective by decay, replaced by new ones, measuring 12 by 12 inches. The bents are also to receive attention soon. Ties on this trestle are 6 by 8 inches, lying on their 6-inch edges, and spaced 22 inches from center to center.

Bridge No. 16, trestle, Young's run, near Warren. At Young's run, near Warren, is a nine-bent trestle, 140 feet long, which has recently undergone partial renewal and repair. The span over the water-way is 20 feet long, the stringers in this span are two 12 by 12-inch pieces, one above the other. Elsewhere the spans are as usual on this road, 12 feet long, and stringers, single, 12 by 12 inches where new, and 10 by 12 inches where not renewed.

Bridges No. 17 and 18, Warren. The first structure on entering Warren is a short, well built trestle approach to a wooden bridge over the A., Y. and P. Railroad track. The bridge itself is soon to be replaced by an iron one, resting on stone abutments.

Bridge No. 19, trestle. Just south of this is a trestle, 415 feet long, and of 20 feet average height. It is well braced, laterally and longitudinally, and in good repair, having been but recently renewed. The cross ties are 6 by 8 inches, spaced 12 inches apart, and the track-stringers, 12 by 12 inches, 30 feet long; bents in this trestle being 15 feet from center to center.

Bridge No. 20, Niles, Howe. At Niles the first structure is a seven-panel Howe truss bridge, 72 feet long. The lower chords are 6, 6½, 6½, 6 by 12 inches; end main braces, 7 by 10 inches, and tie rods, double, 1½ inches diameter. Floor beams are 6 by 14 inches, four per panel. Track-stringers, 8 by 10 inches. The bridge has neither ties, nor guard rails.

Niles, Bridge No. 21, Howe. The next is an eight-panel low Howe truss bridge, 48 feet long, over the track of the——

The floor beams in this are suspended. They are 6 by 14 inches, two in each panel; track-stringers are 8 by 10 inches, and the bridge has no ties nor guard rails. The track-stringers and other parts are affected by decay in many places.

Bridge No. 22, Mahoning river, Howe truss. Adjacent to the foregoing is a two-span Howe truss bridge, 240 feet long, over the Mahoning river. The first span contains 14 panels, and the second ten, each being 10 feet long. The bridge rests on good stone masonry abutments and a stone center pier. The lower chords, which are continuous throughout both spans, are 6, 6, 6, 6 by 14 inches, with iron packing. The end main braces are 9 by 10 inches, and the tie rods, three in number, are two 2 inches, and one 1½ inches in diameter. The floor beams are 6 by 14 inches, four in each panel; track-stringers, 8 by 11 inches. There are four broken angle irons. In the first span the inner piece of the lower chord in the second panel south of the center, on the east side, has a fracture extending entirely across the top, and as far as I was able to ascertain, into the piece to a depth of more than two inches. A careful examination of the lower surface of this piece gave no indication that the fracture referred to extended through the piece, and could not be due, therefore, to a tensile strain. I do not consider this as weakening to any dangerous extent



the bridge in which it was found, and only mention it that it may not appear to have been entirely overlooked.

The trestle approach on the south end of this bridge is very old, and many of its parts need renewal. The ties are light, 6 by 6 inches, and space 22 inches from center to center.

My examination of this road did not reach south of this point. Being prevented by an appointment I had made with the Superintendent of the Alliance and Lake Erie road, from continuing the inspection of this road when I reached Niles, I postponed my examination of the remaining eight miles of the Painesville and Youngstown road from Niles to Youngstown, and have not since been able to reach it again. The following information concerning features of the portion of the road not examined by me, I obtained from Mr. J. A. Newcome, Superintendent, and Mr. Gilmore, the bridge master:

- |  |                                  |
|--|----------------------------------|
| 1st. Near Niles; Carleton trestle, 70 feet long. Overhauled in part in spring of 1881. Some new timbers yet to be put into it.         | Niles, Carleton trestle.         |
| 2nd. Crandon trestle, about 200 feet long, and 20 feet average height. Overhauled and renewed in July, 1879.                           | Crandon trestle.                 |
| 3d. Curved trestle, south of Girard. Overhauled, renewed and thoroughly repaired in July, 1879.  | Girard, trestle.                 |
| 4th. Four Mile Run, trestle, about 415 feet long. Overhauled in March, 1881.   | Four Mile Run, trestle.          |
| 5th. Curved trestle, 175 feet long, immediately south of Four Mile Run trestle. Overhauled in March, 1879. Bents and bolsters all new. | Curved trestle.                  |
| 6th. Wilson trestle, near Youngstown, about 200 feet long. Overhauled in June, 1879. This is to be filled.                             | Wilson trestle, near Youngstown. |
| 7th. Howe truss bridge at Youngstown, 100 feet long. In good condition, said to be the best on the road.                               | Howe truss, Youngstown.          |

A special report, embodying a portion of the information contained in this was submitted soon after my inspection of the road, and is now on file in the Commissioner's office.

The rolling stock of the road is in very bad order. At date of my inspection there appeared to be only two locomotives in serviceable condition. The repair shops in Painesville are a few small shed-buildings, all in a dilapidated condition, and very inadequately equipped. Appearances along different parts of the road indicate, that a large amount of work in the way of repairs of trestles has been done within a recent time, and, according to the statement of the officers of the road, still more work of this nature is in contemplation, as fast as the necessary material can be obtained.

III. OHIO CENTRAL RAILROAD, from Toledo to Bush's Station, and from Bush's Station to Columbus. Inspected July 12 and 13, and August 21 and 28.

The road from Bucyrus northward to Toledo is in course of completion, and therefore not in condition for reliable report. From Bucyrus south the road bed is good, well cared for, and fairly well ballasted,—notwithstanding the fact that the construction and completion of the new portions of the road demand almost the entire attention of the management. The iron is heavy, and well laid, ties good, and drains generally open, and clear of rubbish, or being opened.

The bridges on the Toledo line are all new, substantially built

Road bed.

Bridges.

wooden structures of the Howe truss pattern. On the Columbus branch are two wooden Howe truss bridges of an older date, and also a number of short span wooden bridges of other patterns

Howe truss  
over the L. S.  
& M. S. R'y.

Not including the long pile bent trestle forming the approach to the passenger depot in East Toledo, the first structure going southward from Toledo is a Howe truss bridge 100 feet long over the L. S. and M. S. R. R. A description of this will serve for every other bridge of its kind on this road, they being with slight modifications of dimensions of timbers, due to difference in length of span, almost exact counterparts of each other.

The abutments supporting this bridge are oak timber pile bents, and consist of double rows of piles, with rows four and one-half feet from centers, and six piles in each row. They are braced laterally with two courses of 3 by 10-inch oak planks, spiked to each pile. The caps of these bents form the wall plates on which the bridge rests. There are eight panels, each being 12 feet 6 inches long. Height of truss is twenty-three feet. The lower chord contains four pieces, 6, 7, 7, 6 by 14 inches, and the upper chord is like it, except that its depth is only 12 inches. End main braces are double, 9 by 11 inches, and end tie rods three in number, each two inches in diameter, and upset. Lower and upper lateral braces are 6 by 6 inches, and lateral rods 1 inch in diameter. Floor beams, 6 by 14 inches, and spaced 20 and 22 inches from centers. Track stringers, two under each rail, each being 6 by 12 inches in cross section. Ties are 6 by 8 inches, and 12 inches apart. A 4 by 6-inch wooden guard rail is bolted to the ties, 18 inches outside of each rail.

Portage river,  
south of Pemberville.

In the bridge over Portage river, south of Pemberville, the abutments under each end are two framed bents, supported by two plumb and two batter posts, all, including sills and caps, perfectly sound oak timbers, 12 inches square in cross section. The same is the case in the bridge at Broken Sword. In the bridge at Bucyrus there were three broken iron angle blocks. In the bridge at Mt. Gilead a counter brace had been broken by an accident. It was to be replaced shortly. In the bridge at Marengo an end post was missing. The bridge at Granville had three, and the one over the canal at Millersport one, broken angle irons.

Trestles.

The longest trestles on the road are the pile trestle at Toledo, already mentioned, the approaches to the bridges at McCutchenville, Bucyrus, Mt. Gilead, Lincoln Centre, the trestles near Baltimore, Basil, Sycamore, Georges creek and Black Lick.

Truss bridges  
betw. Bush's  
and Basil.

The two low truss bridges between Bush's and Basil are of peculiar construction, and can not well be described without diagrams. They are supported on good stone masonry abutments, are entirely new, sound, and well built.

Alum creek  
and Black  
Lick, Howe.

The Howe truss bridges over Alum creek and Black Lick are not as well built as like structures on newer parts of the road. They appear to have proved inadequate for the service required of them, and are now being overhauled, and substantially strengthened in the parts found deficient.

Trestle.

In the construction of trestles on this road a certain fixed standard pattern prevails. The ruling style being framed timber bents, consisting of two vertical, and two batter posts, which rest on a sill that is some-



times *partly* buried in the earth, but is usually on or even slightly raised above the surface. This is surmounted by a cap, which supports directly the single, 12 by 14-inch, or double, 6 by 14-inch track stringers. These bents are 14 feet from centers. The ties are 6 by 8 inches, and from 16 to 20 inches apart from center to center, with a 4 by 6 or 6 by 6-inch wooden guard rail bolted to alternate ties. The bent timbers are uniformly 12 inches square in cross section. In some of the long trestles a system of lateral bracing is being introduced, which consists of two 6 by 6-inch timbers, crossing each other diagonally, and reaching from bent to bent, being similar in application to the lateral braces of the ordinary Howe truss bridges. The road master states that he has found these very effective in keeping the track in perfect alignment, where other methods of lateral bracing have proved inefficient.

The completed portions of this road are already in good condition, and there appears everywhere a manifest tendency to make it a road that will take a high rank among the railroads of the State, as rapidly as, with a due regard for non-interference with its already heavy traffic, this can be done. Even now a number of trestles, some of which are scarcely a year old, are being filled and replaced by permanent embankments, and it seems quite probable that this course will be continued with the majority of the shorter structures before any of them yield to decay, and as soon as the amount of opening required for water way can be determined from observation.

General condition.

#### IV. CLEVELAND, PAINESVILLE AND ASHTABULA RAILWAY, from Becker avenue, in Cleveland, to the town of Euclid.

It is of the standard gauge, but light in construction, intended only for passenger traffic, being a suburban railroad.

A low Howe truss bridge, at Euclid, is old and in a dilapidated condition. Recent renewal of, or rather additions to, its lower chords, make it reasonably safe for the present, but the rapid decay of the upper chord and web members indicate that further repairs and renewals are desirable. It rests on good stone masonry abutments. The floor beams, track stringers and ties are in good state of preservation. There are no guard rails.

Euclid, Howe truss.

No. 1. The western approach to the above bridge is a 28-span trestle, whose bents are 16 feet from center to center. The bents are 10 by 10-inch timbers, consisting of sill, cap, one center plumb and two exterior batter posts, braced laterally by two, 2 by 10-inch planks, spiked to posts, and longitudinally from bent to bent in same manner. The track stringers are three 6 by 12-inch pieces under each rail. The ties 3 by 6-inch planks, from 2 to 3 inches apart. There are no guard rails. Timbers are all in good condition.

No. 1, west approach.

No. 2. The next structure from the last mentioned, going toward No. 2. Cleveland, is a 2-span bridge, resting on stone masonry abutments and intermediate timber bent support. Each span is 40 feet long, and consists of a trussed beam, having three pieces, each 6 by 12 inches, trussed with two 1½-inch iron rods. There is on this structure a light inner railroad iron guard rail, but no outer one. The ties are 3 by 6-inch plank, placed 2 inches apart.

No. 3. Following the last named is the Eddy road trestle, containing thirty-eight spans, each being 16 feet long. It is similar in style of

No. 3, trestle.

construction and dimensions of its parts to the trestle at Euclid, except that in this there are two track stringers, each 6 by 14 inches. It has no guard rails. A number of caps and batter post gave indications of decay, although none were found to be seriously weakened.

No. 4, trestle. No. 4. One mile west of the above is another trestle, containing 21 spans, each being 16 feet long. In style of construction and dimensions of various parts, it is a counterpart of the trestle at Euclid, here referred to as No. 1. The ties are 3 by 8-inch oak planks, placed from  $2\frac{1}{2}$  to 3 inches apart. It has no guard rails.

No. 5, trestle.  
Oak Grove. No. 5. The trestle at Oak Grove, which has thirty-six 16-foot spans, crosses a deep ravine. It is at its maximum thirty-three feet high. There are under each rail three 6 by 14-inch track stringers, and the bents are double braced, laterally and longitudinally. The ties are 8 by 3-inch oak plank, and there are no guard rails.

No. 6. No. 6. With a slight exception, noted in trestle No. 3, the material in all structures on this road are in good condition, and, except in case of the ties, which are too light to sustain the wheels in case of derailment, are of sufficient strength for the very light service required. The entire absence of guard rails on all the trestles will be noticed. There is no protection whatever in case of derailment, and an accident of this nature occurring on any of these trestles must inevitably be productive of serious injury to persons on the cars, especially if it should occur on the Oak Grove trestle, where the train would fall from a height of thirty-three feet.

Rolling stock. The rolling stock of the road is a very light locomotive of peculiar construction, and two passenger coaches, with seats arranged as in the ordinary street car, longitudinally along the sides. Trains run at a low rate of speed, are kept well in hand, and stop at any point on the road to discharge or take up passengers. There is also one platform freight car used, as I was informed, principally for the purpose of hauling supplies of fuel for the road. There is a small station house at the Becker avenue terminus, also a car shed with facilities for sheltering cars and engines, and making ordinary light repairs.

V. CHAGRIN FALLS AND SOUTHERN RAILROAD, from Solon, a station on the Mahoning branch of the N. Y., P. & O. Railroad, to Chagrin Falls.

This is a narrow gauge road, five miles long. The road-bed, ties and rails are in very bad repair. Until very recently there was no ballast on any part of the road, and this want is now being supplied in part by filling in the ties between rails with sand and earth. At date of my inspection the weather had been very dry for several weeks, but from indications there was nothing to discredit the statement of a person connected with the road, who informed me that in the low places on the road the car wheels, during the wet season, ran in the mud to a depth of from three to six inches. Instead of turning the water away from the road-bed it is held in by a peculiar system of banking up the ties, adopted on some portions of the road, the earth for this purpose being taken from the road-bed between the rails.

A special report having been submitted on this road at the date of

my inspection, the subject-matter therein referred to will not be further noticed here.

There is on this line of road only one truss bridge. It is a wooden, <sup>Bollman truss bridge.</sup> modified Bollman truss of fifty feet span, crossing the Chagrin river. It rests on stone masonry abutments. Its timbers are in good condition. One truss, owing to defective adjustment, probably, is sprung a few inches out of line.

Near Chagrin Falls is a well built two-arch stone masonry viaduct, <sup>Chagrin Falls, stone arch.</sup> over a public highway.

All other structures are wooden trestles, of a uniform style of construction, bents being twelve feet from centers, framed, with sill, two vertical and two batter posts, surmounted by a cap, and a single 12 by 14-inch track-stringer under each rail. The substitute for ties on trestles and bridges on the entire road is a 2 by 6-inch board, fastened to the track-stringers, if fastened at all, by the iron spike which holds the rail in place. These ties are generally loose, and warped out of shape, and are in many places two feet apart. There is not a vestige of a guard rail on any part of the road. <sup>Wooden trestles.</sup>

#### VI. THE ALLIANCE AND LAKE ERIE RAILROAD, from Alliance, Ohio, to Phalanx, Ohio.

A narrow gauge road connecting Alliance, on the Pittsburgh, Fort Wayne and Chicago Railway, with Phalanx, a station on the Mahoning branch of the N. Y., P. & O. Railroad. The line is twenty-five miles long.

As regards grade of the road-bed it follows to a great extent the <sup>Road-bed.</sup> natural surface of the country over which the road passes. Until very recently there was no ballast on any part of the road, owing to the difficulty of obtaining any suitable material for this purpose on or in the vicinity of the line. Ties are in fairly good condition, but many broken ones were found. The iron rail is light, and very much out of surface and alignment, and gives indication of the unusual wear and strain to which it is subjected by reason of the rough and unsubstantial character of the road-bed.

No. 1. Beginning at Alliance, and going toward Phalanx, the first <sup>No. 1, wooden Howe.</sup> structure is a wooden Howe truss bridge, crossing the Mahoning river. It is of the usual pattern, except that it has no end posts, and is 76 feet long. The lower chords consist of three pieces, 5, 6, 5 by 12 inches, with wooden clamps or packing block let into the chord timbers to the unusual depth of 2½ inches. The floor beams are 5 by 12 inches, 22 to 24 inches apart, and there are two, 5 by 12-inch track-stringers under each rail. Ties are 5 by 7 inches, and spaced 18 to 20 inches from centers. There are no guard rails. The bridge is said to have been built in 1875, but looks much older. Although light in construction, and apparently beginning to suffer from age and decay, a careful examination disclosed no specific points of weakness anywhere in this bridge.

No. 2. Following this about two miles from Alliance is the Hartzell <sup>No. 2, Hartzell trestle.</sup> trestle; ten spans, of fourteen feet each from centers of points of support. The vertical and batter posts are 8 by 8 inches in cross section; sills and caps, 10 by 12 inches. Track-stringers are 10 by 12 inches, there being one under each rail. Every bent is double cross or X-braced laterally, and eight courses of 5 by 5-inch longitudinal horizontal braces extend

throughout the entire length of the trestle. Ties are 5 by 7 inches, and 20 inches from center to center. There are no guard rails, and the ties, owing to the short distance they extend over the trestle outside of the rails, as well as on account of their distance apart, would afford no protection to a train in case of derailment.

No. 3, trestle. No. 3. About three miles further on is a twelve-span trestle, with "boxed" plumb and batter posts, its bents being 24 feet from centers. There are two 6 by 16-inch track-stringers under each rail, which are trussed with a 1½-inch iron rod. The truss rods are anchored in iron castings placed over the joints. The stringers rest on 8 by 14-inch corbels, which are 8 feet long. Post, sill and cap timbers are double, 4 by 9 inches in cross section. Bents are braced laterally by means of two (an upper and a lower) set of double cross or X-braces, which, however, are only spiked, and not bolted to posts, caps and sills. Four courses of longitudinal 6 by 6-inch timbers extend horizontally from end to end of the trestle. These are bolted to the vertical and batter posts, and are kept from sagging by being suspended from or supported by a system of light iron rods, a peculiar arrangement which I did not find anywhere else. The timbers in this work are sound, and the structure is of sufficient strength to support any weight which, in the course of ordinary traffic on this road, can come upon it. As in case of other similar works, however, no provision has been made for security in case of accidents to a train while passing over it, there being no guard rails notwithstanding the fact that the ties are light, short and too far apart to afford protection to a train in case of derailment. The maximum height of this trestle is 35 feet.

No. 4, trestle. No. 4, the next structure, is a trestle and 2-span wooden Howe truss deck bridge, over the Mahoning river, about 8 miles from Alliance. The length of the entire work is 580 feet. The trestle is in style of construction and dimension of its several parts like No. 3, above described. The bridge rests on stone masonry abutments and center pier. Each span contains 8 panels each, measuring 9 feet 4 inches in length. Height of truss is 19 feet, and width out to out, 10 feet. Floor beams are 6 by 12 inches, four per panel, and track stringers, 5 by 12 inches, two under each rail. There are at present no guard rails on any part of the bridge or trestle, and questions already raised as regards insecurity in case of accidents to trains, in reference to other structures on the road apply equally to this.

No. 5, trestle, Palmyra. No. 5, is a trestle on pile bents near Palmyra. It is 700 feet long. There are four white oak piles to each bent, which are surmounted by a cap and an 8 by 10-inch corbel, on which rest the 10 by 12-inch track stringers. The bents are 14 feet from center to center, except one near the northern extremity, in which the span is 24 feet between points of support. In this the track stringers are double 6 by 16-inch trussed beams, supported on stone abutments. Ties on this trestle are 5 by 7 inches, and 22 inches from center to center. There are no guard rails on any part of it, otherwise the structure is in good condition, with the exception of some of the piles which are decayed, thus far through the sap wood only.

Trestles. Following this, are the "Tom Wood" trestle, 13 spans, of 16 feet each; the "Pritchard" trestle, 10 spans, of 16 feet each; the "Roberts"

trestle, 7 spans, of 16 feet each; the "North Mahoning" trestle, 45 spans, 16 feet each; the "Humphrey" trestle, 10 spans, of 16 feet each, and finally, a 10-span trestle near Braceville. All these, except the last, are pile trestles, similar in style of construction, arrangement and dimensions of their several parts, to the work above referred to as No. 5, and situated near Palmyra. In all of them, with the exception of decayed sap wood at the bottom of piles, the timbers are sound. None of them are provided with guard rails. In the "Humphrey" trestle there are only three piles in each bent instead of four, as in all the others.

It is plainly evident that the present management during the few months it has had control of the road, has infused some life into it, and recuperated it from the stagnation toward which it was tending. It is beginning to rise up out of the mud which had almost submerged it out of sight. A coal branch, about half a mile long, built to a newly opened coal mine, near Palmyra, will add materially to its resources. New rails, good ballast, and ordinary provisions of guard rails, and strong, closely laid ties on its bridges and trestles are essential for security of passengers and train employes on this road.

VII. THE COLUMBUS, MT. VERNON AND DELAWARE RAILROAD, from Hudson to Columbus, O., through Akron, Millersburg and Mt. Vernon.

Its length is one hundred and forty-four miles, single track and standard gauge.

*Road bed.* Generally good and fairly well drained, except in some of the deep cuts through the hilly portions of Holmes county, where washings from side slopes have filled the ditches in many places to a level with the top surface of the ties. This appeared, however, to be only a temporary local fault, which a few weeks' work of section men later in the season would correct. The best part of the road was, in my judgment, between Orrville and Killbuck. Fences are wanting altogether in but few places, but are not anywhere well kept up. Ties, at date of inspection, were in very bad condition. The summer's work of replacing those broken and decayed had just commenced. Later in the season a casual passage over the road showed a decided improvement in this respect, even when a portion only of the new ties had been put in position.

The rail, from Hudson to Millersburg, is miserably bad, except in occasional sections aggregating about five miles in length, where new rail has been laid, principally on curves and over, and on approaches to, trestles and bridges. The rail on the division from Killbuck to Columbus is much better than on other parts of the road.

*Structures.* With one exception, there are on this road more bridges and trestles than on any other road in the State. Between Hudson and Akron there is one fine stone arch bridge, strong and in good repair. Between Hudson and Killbuck there are in addition twenty-three wooden bridges and trestles, all short—bridges, from fifty to eighty feet span, and trestles, from thirty to one hundred and thirty feet long, except the one about two miles north of Marshallville, which is 1,410 feet long. The bridges are all of the Howe (half or "pony") truss pattern, strongly built originally, but weakened by age and decay. Their average age is seven to nine years. In all these structures any immediate danger

has been guarded against, by placing under each one or two bents, which afford additional points of support and reduce the clear span in most cases to less than thirty, and I believe, in none exceeding forty feet.

Marshallville  
trestle.

The Marshallville trestle, already referred to, is strong and well built, with timbers in excellent preservation. The road over it is on a  $4\frac{1}{2}$  degree curve. It is in the usual style of construction, the sills being above ground. There are two plumb and two batter posts, and caps and corbels, all 10 by 12-inch oak timbers, and the sills are 12 by 12 inches. There are two  $7\frac{1}{2}$  by 14-inch track stringers under each rail. Ties are from 8 to 10 inches apart, and 12 feet long, and a wooden guard rail or ribbon piece is bolted to them 10 inches outside of the rails.

Killbuck.

At Killbuck station are bridges numbered by the railroad company 26 and 27. Number 26 is a queen-post truss bridge 80-feet span originally, but reduced one-half by a strong bent under its middle point. It is the northern approach to bridge No. 27, which is a strongly built Howe truss, 160 feet clear span, resting on good stone abutments. It is materially affected by decay of its chords and web members, and this, together with the shock to which it is subjected, by reason of being a part of the arc of a curve formed by the track in crossing it, suggests the necessity of re-enforcing it soon. A careful examination disclosed no signs of yielding or specific points of weakness. The bridges, numbered 28 to 36, inclusive, and situated between Killbuck and a point about 3 miles from Summit Siding, are all short single span stringer and low queen-post trusses, except the one at Black Lick station, which is a half Howe truss. With the exception of the last mentioned, they are all in good condition; two are now undergoing reconstruction. The Black Lick bridge is old and much decayed. Its original clear span was 84 feet, but this has been reduced to about 60 feet, by placing under it two bents 10 feet from each abutment.

Bridges 28 and  
36.

Bridge No. 37,  
south of Black  
Lick.

Bridge No. 37, about  $2\frac{1}{2}$  miles south of Black Lick, is the first of the high trestles. It is 670 feet long, on a curve which I calculated approximately at  $3\frac{1}{2}$  degrees, and its maximum height is 66 feet. The bents are 24 feet from center to center, and consist of double tiers of plumb and batter posts—two plumb and four batter posts in the lower, and two plumb and two batter posts in the upper tier. All principal post timbers, sills and caps are 12 by 12 inches, oak. Four courses of 6 by 12-inch longitudinal horizontal beams, bolted to the plumb and batter posts at each bent, extend throughout the entire length of the structure. Longitudinal inclined braces reach from a point half-way up on the vertical posts to a suspended cap half-way between the bents, thus giving an additional point of support to the track stringers. These are double under each rail, each being 8 by 16 inches, resting on corbels 8 feet long. The corbels are 8 by 17 inches. Ties are 6 by 8 inches, 12 feet long and 18 inches from centers. A wooden guard rail is bolted to the ties about 10 inches outside of rails. Timbers are all sound, and entire structure appears to be under good supervision and well cared for. When taking into consideration the unusual height of this trestle and the additional fact that it is on a curve, the lateral braces are not, in my judgment, quite adequate for sustaining the strains likely to come upon them under extraordinary circumstances or combination of circumstances that



might arise, such as a heavy freight train running over the trestle at very high speed during a severe windstorm. All trains are required to pass this structure at a speed not exceeding six miles per hour, and as far as I had occasion to observe, this rule was strictly adhered to by train men. At the same time, I am of the opinion, that a departure from this rule would strain the structure beyond the point of absolute safety, by causing vibrations that would ultimately tend to weaken it.

Bridge No. 38, about one mile beyond (south) the above, is like No. No. 38. 37 just described in every respect, except that it is only about 500 feet long.

Bridges 39 and 40, between Summit Siding and Gann, are high Nos. 39 and 40. trestles, 118 and 184 feet long, respectively, and similar in style of construction to like structures already described. In each the timbers, especially the bottoms of plumb and batter posts, are weakened by decay. Both are to be renewed shortly, and timbers for this purpose are already on the ground.

No. 41 is a low (18 feet vertical height) trestle, 1,140 feet in length. No. 41. It was originally built with bents 24 feet apart and inclined longitudinal braces, extending from the foot of batter posts to points half-way between bents, as already described in bridge No. 37, but these have within late years been taken out and well built framed bents put in, so that the clear span between supports is now less than 12 feet, with sills that were originally adapted to the old style of structure. In other respects, as regards manner of construction, arrangement and size of timbers, this trestle corresponds with those previously described. On account of decay and age the old set of supports will have to be renewed very soon.

No. 42, at Gann, is a half Howe truss bridge, over a mill-race. It is No. 42, Gann. about 60 feet long, old, and very much decayed, but adequately supported by a framed bent near each end.

No. 43 is a trestle of the usual style on this road, which connects No. 42 with the large bridge over Mohican creek, which is number 44, and is a two-span Howe truss bridge, each span being 160 feet, and the total length of the structure, 335 feet. It is a strong, well built structure, strengthened by wooden arches, 20 inches deep by 6½ inches wide. The lower chords are 6, 8, 8, 6 by 15 inches. I found three broken angle blocks. The timbers appear strong and sound, and from a careful examination I gained the impression that for its age this was the best preserved bridge on the road.

No. 43. trestle.  
No. 44. Howe  
truss.

Nos. 45 and 46, between Gann and Danville, are high trestles with Nos. 45 and 46. double tiers of plumb and batter posts at their highest parts. They are similar in construction to No. 37 and 38, and workmen were, at date of inspection, engaged in overhauling and renewing both structures. Each is about 500 feet long.

Nos. 50, 51, 52 and 53 are single-span Howe truss bridges, between Nos. 50, 51, 52 Danville and Gambier, the last mentioned being 100 feet span, the others and 53, Howe. 130 feet. In each of these the chords and web-members are more or less decayed, as are also the wall plates. The stone masonry of abutments is in excellent condition.

Nos. 54 and 55, two-span wooden arch Howe truss bridges, each 294 Nos. 54 and 55. feet long, are situated, the first at Gambier, and the last mentioned about half way between Gambier and Mt. Vernon. They are similar in style of construction, and dimension of parts to bridge No. 44 at Gann.



No. 57, Pratt  
truss.

No. 57 is a two-span iron Pratt truss bridge, built by the Keystone Bridge Co. in 1872. The spans are 160.3 feet each, from centers of end pins. It rests on good stone masonry abutments, and stone masonry center pier. The bridge spans the Vernon river at Mt. Vernon.

No. 59, Howe  
truss.

No. 59 is a wooden Howe truss bridge, between Mt. Vernon and Bangs. It rests on good stone masonry abutments, but is only 6 feet above low water mark of the stream which it crosses.

There are a number of smaller half truss and stringer bridges, between Mt. Vernon and Sunbury, which are being repaired and overhauled, and cannot therefore be fully reported upon here. The bridges from Sunbury to Columbus, and on other parts of this road, have been specially reported on, and are not again referred to here. Nearly all of them are at this time undergoing reconstruction and repair. The fact that nearly all these wooden bridges and trestles date from the original construction of the road, in 1872 to 1874, makes it apparent that they have reached the end of their effective service almost simultaneously, and this has brought upon the road an unusually heavy burden for their repair and reconstruction during the present and past year. There is, however, abundant vitality in the road and its management to carry it over this crisis and evidence in the work now under way in this direction, that it will be accomplished in due time.

Special report.

The special reports, furnished at a previous date, contain detailed information on many structures only referred to in a general way here. Many of the bridges not described in detail are those which are marked for early renewal and reconstruction, and may therefore be out of existence or greatly changed before this report is published.

Note.

NOTE.—In corroboration of the views expressed in the above report by the Special Inspector, in reference to the intention of the manager of the Cleveland, Mt. Vernon and Delaware road, to bring its condition up to every reasonable requirement of safety, the following letter from the General Superintendent is published. By reference to the special reports on file in this office, it appears that all points of criticism, relating to the condition of bridges, are covered by the new structures which the General Superintendent states are in part built, and in part under contract. The faults pointed out in condition of track would also appear to be met by the 2,000 tons (about twenty-two miles) of new rail already laid, and the additional 2,000 tons expected to be put down :

AKRON, OHIO, February 3, 1882.

HON. H. SABINE, *Commissioner of Railroads and Telegraphs, Columbus, O :*

DEAR SIR: Your favor of the 24th ult. reached my office at a time when I was absent. Consequently my reply has been unavoidably delayed.

I am much obliged to you for calling my attention to the requirements of your department. As you truly remark, I have not been aware of the delinquencies of the past management. I can assure you that I will make up for them in any way in my power.

As you refer more particularly to the condition of the bridges and trestles on this road, I will state what is being done toward their renewal.

We have under contract with the Smith Bridge Co., Toledo, the following bridges:

No. 58. Over Dry creek, two miles south of Mt. Vernon, 52 feet span, iron riveted, plate girder.

No. 60. South of Mt. Vernon, over Dry creek, 107 feet span, Howe truss, white pine.

No. 62. South of Mt. Vernon, over Dry creek, 107 feet span. Howe truss, white pine.

No. 90. At Galena, 96 feet span, deck bridge, over Little Walnut creek, Howe truss, white pine.

No. 91. Over highway, Galena, and over Little Walnut creek, 48 feet span, iron riveted, plate girder.

No. 107. Over Alum creek, west of Westerville, 166 feet span, Howe truss, white pine.

In order to more fully answer your inquiries, I have had the progress of this work examined this week. I also sent for Mr. Smith, the head of the Smith Bridge Co., who met me at Akron Wednesday evening; and from what he says, and from my own observation, I think I can confidently say that all the bridges under this contract will be finished within a few weeks.

We have also under contract with the Cleveland Bridge and Car Works the following bridges:

No. 6. Over canal south of Akron, 56 feet span, riveted iron girder.

No. 9. Chippewa, 52 feet span, riveted iron girder.

No. 16. Over Salt creek, 46 feet span, riveted iron girder.

No. 26. Killbuck, two spans, each 43 feet, riveted iron girder.

No. 27. Killbuck, 160 feet span, Howe truss.

No. 35. Black creek, 84 feet span, Howe truss.

No. 42. Mill-race, 46 feet span, riveted iron girder.

No. 44. Mohican, two spans, 167 feet each, Howe truss.

No. 50. Jelloway, 132 feet span, Howe truss.

No. 51. Jelloway, 130 feet span, Howe truss.

No. 52. Jelloway, 130 feet span, Howe truss.

No. 53. Schenck, 111 feet span, Howe truss.

No. 54. Owl creek, two spans, 147 feet each, Howe truss.

No. 55. Owl creek, two spans, 145 feet each, Howe truss.

A good deal of work has already been done by the contractors under the foregoing contract, and we have made them considerable cash advances upon engineer's estimates. It would take me some little time to give you full particulars of the exact present condition of the work under this last-named contract. I am going to Cleveland to-day, partly for the purpose of seeing these contractors and pressing forward their work, which, according to the terms of the contract, should have been finished before this date. But, owing to difficulty in getting material, we have thought it fair and right to allow them a little time.

I may further say that we are putting additional bents under a number of long spans in bridges, which are not embraced in the foregoing brief account.

I have recently employed the services of a thoroughly practical bridge builder, who is now giving his time to the inspection and repair, with company's force, of other bridges than those under contract. It is the intention of this company to commence, as soon as spring opens, to fill a great many of the longer trestles. For this purpose we are contracting for the early delivery of a steam-shovel, which we expect to put at work by next March, and keep constantly going through the spring, summer and fall.

As regards the condition of our track generally, I may state that, since last summer, some two thousand tons of steel rails have been put into the main track. I am now having a good deal of repair iron, which is in tolerably fair condition, put in track in place of worn out rails. I am promised by our president some two thousand tons more steel rails, for delivery in the spring, and when these are put in the track we shall have a very much improved road.

Should you desire any more explicit information, I shall esteem it a favor if you will call upon me for particulars, and I will take special pains to make my reports to your department full and satisfactory at all times.

I am, dear sir, very truly yours,

N. MONSARRAT, *General Superintendent.*

# VIII. CLEVELAND AND MARIETTA RAILROAD, from Marietta to Canal Dover. Inspected July 20, 21 and 22, and again at New Comerstown August 5, 1881.

This road was begun in 1870 at Marietta, and completed in 1871 to a point about 35 miles north, the remainder, to Canal Dover, being built in 1873 and 1874, and completed in 1875. From Marietta to New Comerstown it follows the winding course of two creeks, pierces three high ridges by means of tunnels, and crosses one, between Kimbolton and

Post Boy Station, by passing over the Summit with a "switch back." The natural difficulties in the way of railroad construction presented by the portion of the State through which this road passes, though not exceedingly great at any one place in comparison with those found in mountain regions, are nevertheless formidable, and continuous from Marietta to New Comerstown. On this part of the road there is a continuous succession of short sharp curves, side hill cuts, a few embankments, and an unusual number of high wooden trestles and bridges. To a casual observer it appears, on a superficial examination of the line of road and its surroundings, that by the exercise of less haste, and more judgment in the original location of the road, many of its disadvantageous features could have been avoided. This view is also held by persons officially connected with the road at present, and, therefore, well acquainted with it.

General remarks on bridges and trestles.

In the entire line, 98 miles in length, there is an aggregate of 32,000 lineal feet of wooden bridges and trestles, or, approximately, 6 per cent. of the entire line is over wooden bridges and trestles. The majority of these have reached an age when their strength is fast giving way, in fact, many have already been entirely renewed within the last four years, and a large permanent force of carpenters is constantly engaged, without intermission of work, as I am informed, in repairing and reconstructing these works. In making these renewals the bridges and trestles are being not only repaired, but in many instances entirely rebuilt on a new system, and one more in consonance with present requirements. In the original structures the vertical and batter posts are of various dimensions, being in cross section 9 by 10 inches, 10 by 10 inches, 10 by 12 inches, and in some cases round logs, 9 inches, 10 inches, and 12 inches in diameter.

New work.

In *new work* all such parts as posts, sills, caps, and corbels are of oak, 12 by 12 inches in section. The span of trestles is, uniformly, as a standard, 15 feet from center to center of points of support; the ties are 6 by 8 inches, placed 4 inches apart, and there is a 5 by 6-inch wooden guard rail bolted to them, 8 inches outside of the track. Track-stringers on this standard span of 15 feet are 30 feet in length, double, 7 by 14 inches, oak, or 14 by 14 inches, single, under each rail. For 18 and 20 feet spans, track-stringers are double, 9 by 14 inches. For spans over 20 feet, and up to 33 feet, they consist of two pieces, 12 to 14 inches in section, laid one above another, and trussed with two, 1 $\frac{3}{4}$  to 2-inch iron rods. The height of truss in new wooden Howe truss bridges is 22 feet, and clear roadway, 14 feet. The ballast of the road is stone, furnace, and coal mine slack and gravel.

Special report.

Many special features and details of structures on this road were brought to your attention in a special report submitted shortly after this examination was made by me, and are not reiterated here. All new work done on trestles and bridges is up to the usual standard of such structures on other roads, but this can not be said of the old or original ones. They are receiving attention, probably, as rapidly as the resources at the command of the management admits of, but not as fast as a due regard for public safety requires. The road is also much in need of another tunnel near Kimbolton, where a high ridge is crossed by a circuitous route and extraordinary grades at a great loss of time

and motive power. The iron on that portion of the road from Marietta to Point Pleasant, is in many places, exceedingly bad, being out of surface and full of low joints. In fact, on account of the continuous and short reverse and double and triple reverse curves on this part of the road, it must be almost impossible to keep the rails in proper condition for any length of time. In passing over the road a third time, early in September, I noticed some improvement in the road-bed here, ballast having been renewed, ditches cleaned, and weeds cut away. A number of workmen were also still at work on repairs of trestles and bridges, but I found no evidence of new iron, and there were still many decayed and broken ties.

IX. THE LAKE ERIE AND WESTERN RAILWAY, from Sandusky, Ohio, to Lafayette, Indiana, or to Fort Recovery near the State boundary line. Inspected August 2, 3 and 4, 1881.

The road-bed is in good condition, well embanked, and drained by side ditches. The ballast is principally gravel, but broken stone is being extensively introduced. Between Sandusky and Fremont there is an aggregate of nine miles of broken limestone ballast, and, beyond Fremont, three miles additional at intervals. The rails are in good condition.

Between Sandusky and Fremont, a portion of the road which has been built within less than two years, there are twelve low trestles, ranging in length from 120 to 250 feet. The spans are 14 feet between centers of supports, and the timbers all sound and in good condition.

At Fremont, crossing the channel and valley of Sandusky river, is a trestle combined with eight spans of a Howe truss bridge, the entire structure being 4800 feet long. The bridge rests on stone masonry piers, which average twenty-two feet in height, and the trestle is from 18 to 20 feet high. The trestle supports are framed bents of the usual form, whose lower sills rest on heavy piles. The trestle posts, caps and sills are 12 by 12-inch timbers. The bents are braced laterally by double sets of 3 by 10-inch cross braces, spiked to vertical and batter posts, and also by horizontal diagonal 6 by 6-inch timbers, which are bolted to the caps, and extend from bent to bent. Track-stringers are 28 feet long, 7 by 14 inches in section. There are two of these under each rail, and one under each guard rail. The span of trestle bent is (the uniform standard on this road) fourteen feet from center to center of supports. The north approach to the bridge, which is near the center of the entire structure, is on a 2 degree curve.

The bridge is in two sections, with an interval of several spans of trestle between. The first, northern section, consists of three spans, each 139 feet long, 133 feet clear, and the next of four spans, 137 feet long, and one span 123 feet long. The height of truss is 22 feet. Number of panels, twelve, each 11 feet 8 inches in length. The lower chord is  $6\frac{1}{2}$ ,  $7\frac{1}{2}$ ,  $7\frac{1}{2}$ ,  $6\frac{1}{2}$  by 14 inches, or 28 by 14 inches. Main braces, double, 7 by 10 inches in center to 10 by 12 inches at ends, counters, similarly, 7 by 12 inches in center to 6 by 8 at ends; tie rods, three in number,  $1\frac{1}{4}$  inches diameter in center to  $2\frac{1}{8}$  inches at ends; also 4 end posts, each 6 by  $8\frac{3}{4}$  inches. Floor beams, 7 by 14 inches, and 18 inches apart, or five to each panel. Stringers, two under each rail, 6 by 12 inches, and one, 6 by 12 inches, end bearer under each guard rail. Ties are 6 by 8

Road-bed.

Low trestle.

Fremont, trestle, combined with Howe truss.

inches, and 18 inches from centers, with a 6 by 6-inch guard rail, placed thirty inches outside of tracks. The same floor system is used on the trestle. For length of clear span, the dimensions of principal parts, as here given, exceed, with one exception, those of any Howe truss bridge in Ohio that came under my observation. It will be obvious from this that the officers having charge of this department of the road are preparing, in their new constructions, to meet every contingency of traffic. The stone masonry of bridge piers is first-class in material and workmanship.

#### Findlay.

At Findlay there is a 150-foot span Howe truss bridge, containing 12 panels, each 12 feet long, and resting on stone masonry abutments, 20 feet high, which is, throughout, almost identical, in style of construction and arrangement of parts, with that at Fremont, the only points of difference noted being that its lower chord is 6, 7, 7, 6 by 14 inches in section, and end main braces, 11 by 12 inches, and center tie rods, two in number, each 1½ inches in diameter; end rods, three each, 2½ inches diameter. In other respects, the two bridges are exactly alike.

#### Bluffton.

The bridge at Bluffton, on the old portion of the road, has been abandoned as a bridge, and will, no doubt, be entirely replaced soon by a new structure. The main weight is borne by auxiliary supports, which reduce the original length to spans less than 30 feet in length. The chords and web members of the original bridge are much decayed, but the temporary supports, with new track-stringers and end bearers, give it the requisite strength for the service required of it.

#### Buckland Howe truss.

At Buckland is a Howe truss bridge, 130 feet long, having ten panels. Height of truss, 21 feet. Lower chords, 6, 6, 6, 6 by 14 inches. Main braces, centre, double, 9 by 9 inches; ends, 10 by 12 inches; counters, 6 by 8 inches to 8 by 8 inches; tie rods, two each, 1½ inches diameter to three, 2½ inches diameter. Floor beams, ties and stringers, as in bridge at Fremont. It has no guard rails.

#### St. Mary's Howe truss.

At St. Mary's there are two Howe truss bridges, one over the canal, 80 feet long, and one deck bridge, containing two spans, 33 and 100 feet long, respectively, over the St. Mary's river. These having already been referred to in detail in a previous special report, a further description is not considered necessary here.

#### Howe truss, near St. Mary's, canal feeder.

On the Munster branch of this road, from St. Mary's to Munster, there is but one Howe truss bridge, over the canal feeder, near St. Mary's. It is 99 feet long, and contains ten panels; height of truss, 21 feet; lower chord, 6, 6, 6, 6 by 14 inches; main braces, from 7 by 9 inches to 9 by 10 inches. Floor beams, suspended, 6 by 14 inches, four per panel; stringers, double, 5 by 12 inches; ties, 6 by 6 inches, and 8 inches apart. The lighter dimension of parts on this bridge are due to the fact that it is on a short local branch road, which is subjected only to a very light traffic as compared to that of the main line.

#### Low trestles between Fre- mont & Lima.

From Fremont to Lima there were noted a number of low short trestles, ranging in length from 30 to 80 feet. The majority of these were described in the special report already alluded to. Some of these need (and are receiving) attention, on account of deterioration, from decay of supporting posts, and from want of guard rails. The same remarks apply to thirteen similar structures between Lima and St. Mary's. Several of these are now undergoing reconstruction and repair, and, as it seems to be most decidedly the policy on this road to have bridges

sufficiently strong, all those needing attention will, no doubt, receive it soon. A number of short low trestles on the Munster branch were found to be in good condition. The spans on these are 16 feet long, with single, 12 by 14 inches, or double, 6 by 1 inch track stringers.

At Lima are extensive and well arranged round-houses, car-sheds, repair and machine-shops, with facilities for manufacture and repair of freight and passenger cars. The plan and arrangement of the several departments of these works are remarkable for their adaptation to the several purposes for which they are intended, and are deserving of more extended description, which, however, to be intelligible, requires the accompaniment of diagrams and drawings.

Car sheds, etc.,  
at Lima.

**X. THE CONNOTTON VALLEY RAILWAY, from Dell Roy to Cleveland.**  
This is a narrow gauge road.

Inspected from Dell Roy to Canton July 24, and from Canton to Bedford September 8 and 9. It was completed from Carrollton to Kent at date of last inspection, the portion north from Kent toward Cleveland, and south from Carrollton toward some point on the P., C. & St. L. road in the vicinity of Bowerston or Denuison, being still in process of construction.

The system pursued on this road is a decided departure from the course usually adopted in railroad construction. All the work is thoroughly well done in the beginning, and, in consequence, that portion of the road, which the managers call finished, presents all the perfect features which characterize a first-class road after years and years of constant attention. All bridges and trestles on the road from Carrollton to Kent were carefully examined, and dimensions of principal parts noted. No reference to details of these structures is here deemed necessary, for the reason that the material used in all wooden bridges and trestles was found to be new and in excellent condition. In dimensions and arrangement of component parts, there was found to be but slight departure from that of similar structures on standard gauge roads, notwithstanding the fact that the maximum rolling load these bridges are required to sustain—on account of lightness of locomotives and smaller capacity of freight cars—cannot be two-thirds that which may be brought upon bridges on other roads in the course of ordinary business.

Departure  
from com-  
mon system.

The first important work north from Dell Roy is a 75 feet span Howe truss bridge. Its lower chords are four pieces, measuring 6, 5, 5, 6 by 13 inches. Upper chords, 6, 10, 6 by 10 inches; floor beams, 6 by 14 inches, from 20 to 22 inches apart; ties, 6 by 7 inches; eight inches apart, and having a 5 by 6 inch guard rail bolted to them.

Howe truss  
north from  
Dell Roy.

Crossing Cold Spring Run, near Carrollton, is a low Howe truss bridge, 50-foot span, similar in style of construction to the preceding one.

Cold Spring  
Run, near  
Carrollton,  
Howe.  
Trestle.

A trestle immediately south of Carrollton, being on a part of the road which was to be abandoned inside of three months, by reason of a slight change of route, was not specially noted.

The Howe truss bridge, at Oneida Station, across Mahoning river, which was carefully measured and inspected in every part, although somewhat lighter than those on the southern part of the road, will serve as a model for details of like structures on this road. It is 96 feet clear span, and its lower chord consist of four pieces, measuring 5, 4, 4, 5 by 12 inches; floor beams, 6 by 13 inches, and 18 inches apart; track

Howe, Oneida.



stringers, two under each rail, each being 6 by 10 inches; ties, 6 by 7 inches, from  $5\frac{1}{2}$  to 7 inches apart, with a 4 by  $7\frac{1}{2}$  inch wooden guard rail, bolted to ties at intervals of 4 feet; end main braces are double, each 10 by  $7\frac{3}{4}$  inches in section, with two end tie rods, 2 inches in diameter; two end posts, 6 by 8 inches; lower lateral braces, 6 by 6 inches, with  $\frac{7}{8}$ -inch rods. The bridge rests on first-class stone masonry abutments. Height of truss, 21 feet and 7 inches. There are eight full 11-foot panels, and two half panels, one at each end.

Oneida Mills,  
mill-race.

Immediately north of this, is a single 23 feet long, 19 feet clear span bridge over the mill-race at Oneida mills. It is a trussed beam, consisting of two,  $5\frac{3}{4}$  by 15-inch oak timbers, and a  $1\frac{1}{2}$ -inch iron truss rod. It is braced transversely, by means of two 6 by 6 inches lateral horizontal struts, placed at right angles to the beam, and one above the other—one set of these at each end, with an iron tie rod, 1 inch in diameter, between each pair of struts.

Straining  
beam.

Near this is another straining beam, single, 44 feet span bridge of peculiar construction.

Between Car-  
rollton and  
Becknell  
bridge.

Between Carrollton and Becknell bridge, the Becknell bridge, the bridge over Hugar run, beyond Oneida, are all like that at Oneida, except that the floor beams of these are suspended and contain an additional one, thus making span of track-stringers less.

Tunnel.

Between Oneida and Robertsville is a tunnel about 700 feet long. It is 15 feet wide, 14 feet 6 inches high, from top of rail to roof, and is to be arched with brick.

Robertsville,  
Howe truss.

North of Robertsville is a low, 50 feet span Howe truss bridge. A trestle over east branch of Nimmishillan creek is now being removed, and masonry abutments for a new iron bridge are being built.

Canton.

Near Canton are the transfer tables, for changing empty or loaded narrow gauge cars to tracks of standard gauge or the reverse. There are also at Canton car-sheds, round-house and repair shops. I counted in the car-sheds here twenty-two new first-class passenger coaches, belonging to the equipment of the road.

Abutments.

At the crossing of Nimmishillan creek, north of Canton, stone masonry abutments for an iron bridge, to take the place of the trestle now in use there, are in process of construction, and the same is being done at two other points about one mile north from this.

Congress  
Lake, trestle.

At Congress Lake is a thirty span pile trestle, there being six piles in each bent; four under the space between guard rails, and one on each side, four feet outside; the latter being drawn in and bolted to the others. The track-stringers, corbels and caps are all 12 by 12-inch timbers.

Trestle.

About one mile north of above is another trestle of the same kind, having ten spans. In this the outer piles are not drawn in at the top.

Mogadore,  
high trestle.

One-half mile north from Mogadore is a high trestle, which is double, cross braced transversely, and has also one set of longitudinal cross braces, extending from bent to bent. It has, in addition to the customary wooden guard rails, an inner one of railroad iron. From Kent to Bedford are a number of short framed bent trestles, from one, two to five span. Several of these are now being filled up, two are being replaced with stone culverts, and, in case of others, stone masonry abutments, for more permanent open trussed bridges are now being



built. The trestles, having served their purpose in carrying construction trains, which are being used to haul material for these permanent bridges, are now being taken out to be used for a like purpose further on, where track laying has just begun.

Of the iron bridge at Kent, detailed drawings and specifications and strain sheets were shown me by the chief engineer of the road. These, having been noted, were subsequently compared with measurements of all important parts of the bridge, and found to agree in every particular where a comparison was made. It is a Pratt truss bridge, built by the Canton Wrought Iron Bridge Company, and is 161 $\frac{7}{10}$  feet long, from center to center of lower chord pins. It rests on cylindrical wrought iron pillars, filled with concrete, and supported on good stone masonry abutments. The original intention was to place the bridge directly on the stone masonry, which would have made a crossing at grade of the track of the N. Y., P. & O. Railroad immediately south of this bridge. This was afterwards changed to an overhead crossing of the road mentioned, which necessitated raising the bridge seventeen feet higher than was at first intended, and hence the use of the four wrought iron cylinders for bridge supports.

The passenger depot building in Canton, belonging to this road and containing the general offices of the road, is one of the finest and best equipped that came under my observation in the State of Ohio. The rolling stock of the road is new and in excellent condition, as far as, from personal observation, I was able to ascertain—the passenger equipment has already been referred to as being equal in comfort, elegance and appliances to that of the best roads of the State. If the system and purpose that appears at present to be the rule of those in charge of the construction and management of the Connotton Valley road continues until it is completed, it will take rank at once among the first roads of the State.

#### XI. THE VALLEY RAILWAY, from Cleveland to Canton via Akron.

A standard gauge road, under excellent management, and in good general repair. The road-bed is well drained, and banked up. Ballast, gravel, worn and thin in some places, especially toward Canton, but is now receiving attention. A few miles north of Akron, and also near Peninsula Station, the road curves around a steep side hill slopes, which are likely to cause inconvenience by continual washing and consequent filling of drain ditches, if they are not also a source of danger from land slides.

Ties are in fair condition, only a small proportion being unserviceable. The track is a heavy rail, in good preservation, fair surface, but not generally well aligned, there being many short lateral bends or kinks in the rails, caused, as I was informed, mostly by careless handling of the rails previous to and while laying them.

The first important structure, going south from Cleveland, is an iron drawbridge of the Pratt truss pattern, spanning the Cuyahoga river. It is 170 feet long, and supported on a stone masonry center pier and stone masonry abutments, all of which are protected from injury liable to be caused by floating ice, timber, etc., by rows of piles driven about them at intervals of from 3 to 5 feet. The floor system of this bridge consists

Kent.

Passenger  
depot in Canton.

Road-bed.

South of  
Cleveland  
Pratt truss,  
Cuyahoga  
river.

of double, 12 by 12-inch track stringers; 6 by 8-inch ties placed 4 inches apart, with a 5 by 6-inch wooden guard rail bolted to them, at a distance of 18 inches outside of each rail. All these timbers are in good condition.

**Strain beam.**

Attached to the south end of this bridge, and completing the span of the water-way, is a single span wooden strain beam or strain rod, 30 feet clear and 33 feet long, consisting of double 9 by 16-inch track-stringers, trussed with three rods, one, 2½ inches diameter between, and two, each 1½ inches in diameter, passing outside of the two stringers. The remaining floor system on this is like that on the drawbridge itself. Timbers are all sound. The north end of this trussed beam rests on the bridge abutment, and the south end on stone masonry.

**Pile trestles.**

Following this are bridges, or rather pile trestles, numbered by the railroad company 4 to 5, and 6, ranging in length from 128 to 60 feet, all of the strain rod or trussed beam style. No. 4 has one clear span of 33 feet, having under each rail three, 10 by 16-inch track-stringers, trussed with four 1½-inch iron rods. The supports are pile bents, in double rows, 4 feet apart, and four piles in each row. Ties are 4 by 8 inches, 18 inches from centers, and a 5 by 8-inch guard rail is bolted to them, 22 inches outside of rails. The caps are 12 by 12 inches, oak timbers, and the stringers rest on 12 by 12-inch oak corbels, 8 feet long. No. 5 has three spans, two of 12 feet each, and one of 26 feet. In the long span there are two, 8 by 15-inch stringers, trussed with two 2½-inch rods. Otherwise the structure is like No. 4. No. 6 also has one 24 feet clear span over water-way, and two short, 11 feet, on each end of this. On the short spans there is under each rail a single, 12 by 14-inch track-stringer. The long span has double, 8 by 16-inch track-stringers, trussed with two 2-inch rods. As regards pile supports, caps, corbels, ties and guard rails, it is like Nos. 4 and 5. With exception of some slight incipient decay in caps and end of stringers, and a little irregularity and looseness of ties in No. 6, all these structures are in good preservation and condition.

**Nos. 7 to 13.**

The structures, part trestle and part bridge, numbered from 7 to 13, inclusive, and situated between Independence and Peninsula Station, are in style of construction like those just described, ranging in length from 12 to 125 feet. Nos. 7, 11 and 13 are single span, over small water-courses. No. 8 has no guard rails. A portion of No. 9 is now being filled up. The long span in this measures 36 feet, and has 3, 10 by 16-inch track-stringers, trussed with four 1½-inch rods. In other respects it is like No. 4. In No. 10 there is one long span, measuring 24 feet, which has a double 8 by 16-inch trussed beam for a track-stringer, truss rods being double, each 2 inches in diameter. No. 12 has three 14 feet spans, and single 12 by 12-inch stringers under each rail.

**No. 14, Peninsula Flats.**

No. 14, about one-half mile north of Peninsula Station, is a trestle over Peninsula Flats, containing twenty-five spans, of 16 feet each. The bents are double, braced transversely by X-braces, and also longitudinally by four courses of horizontal, 6 by 8-inch pieces, extending from end to end of the structure. This trestle has "boxed" vertical and batter posts, and differs in style of construction from that usually adopted for works of its kind. I found its like on only one other road in Ohio. A diagram would be necessary to make a description of it plainly intelligible. The principle adopted, being, to use for posts, sills and caps a

number of pieces of small dimensions, the sum of whose areas of cross section is generally equal to the cross section of like members in ordinary structures. For example, in the trestle under consideration, the ground sill consists of three pieces, two being 3 by 8 inches, and one 6 by 8 inches in section; the posts also are in two pieces, each 6 by 8 inches, as also are the caps. All these are securely fastened together, and to each other by means of numerous iron bolts. Intermediate inclined struts extend from the middle of the vertical posts to a suspended cap, half way between bents, thus affording points of support at intervals of less than 8 feet to the track-stringers. The foot of this inclined strut rests in an iron casting, made especially for this purpose. The advantages claimed for this class of structures are greater strength for quantity of material used, less liability to decay, and hence greater durability, and in case of decay or deterioration of any part, greater facility for replacing or repairing the part defective. A disadvantage, that would occur to me, would be want of stiffness, and, on account of the great number of bolts and joints necessary, a liability to get out of adjustment and repair. The bents are securely braced, transversely and longitudinally. The track-stringers are double under each rail, ties 4 by 8 inches, and only 4 inches apart, with a 6 by 8-inch wooden guard rail bolted to them. Some of the sills and timbers in this work are beginning to yield to decay and need attention; none are as yet, so far as could be determined, much affected, but when decay sets in they will, on account of the low damp situation, soon deteriorate.

No. 15 is a Howe truss deck bridge, 116 feet long and 108 feet span, crossing the Cuyahoga river, and connected with the trestle No. 14 above referred to. The track-stringers are double, 6 by 10 inches, and floor beams,  $6\frac{1}{2}$  by 14 inches, and laid 27 inches from centers. The bridge rests on framed timber bent abutments, which are only 7 feet high. The end main braces measure 9 by 11 inches, and the three end tie rods are  $1\frac{3}{4}$  inches in diameter.

No. 15, Howe  
deck, Cuya-  
hoga river.

No. 16 is a Howe truss through bridge, immediately south of No. 15. It has 8 ten feet panels. Height of truss, 22 feet. Double  $8\frac{1}{2}$  by 10 inch end main braces, 7 by 7-inch counters, three  $1\frac{3}{4}$ -inch end tie rods, 7 by 14-inch floor beams, placed 24 inches apart, and single 12 by 12-inch track-stringers. The lower chords are 6,  $6\frac{1}{2}$ ,  $6\frac{1}{2}$ , 6 by 12 inches. Timbers are all good and sound. Ties are 4 by 8 inches, and 10 inches apart, with 6 by 8-inch wooden guard rails bolted to them. The bridge rests on framed bent abutments, whose timbers are oak, and 12 by 12 inches in section.

No. 16, Howe  
through.

No. 17 is a Howe truss deck bridge, crossing the Cuyahoga river. It has 12 panels of 9 feet each. The floor beams are suspended from the upper chord by  $1\frac{1}{2}$ -inch iron rods. Its end main braces measure  $8\frac{3}{4}$  by  $9\frac{1}{4}$  inches, and it has three  $1\frac{3}{4}$ -inch end tie rods. The upper chords are much affected by decay and are to be repaired or renewed, timber for this purpose being already on the ground. It rests on timber bent abutments.

No. 17, How  
deck.

No. 18 is a new Howe truss through bridge, 75 feet long, over the Ohio canal. It has 6,  $6\frac{1}{2}$ ,  $6\frac{1}{2}$ , 6 by 12-inch lower chords, 7 by 14-inch floor beams, placed 24 inches apart, and single 12 by 12-inch track-stringers. Ties are 6 by 8 inches, ten inches apart, with 6 by 8-inch

No. 18, Howe  
through.

guard rails bolted to them outside of rails. It rests on stone masonry abutments, and its timbers are all new and sound throughout.

No. 19, near  
Everett.

No. 19, near Everett Station, is a new, strong and perfectly sound pony Howe truss, 56 feet long, crossing Furnace run. It is approached from the north and from the south by a single 15 feet span trestle, and rests on strong oak timber bent abutments. Ties are 4 by 8 inches, and from 18 to 20 inches center to center. The bridge has no guard rails.

Nos. 20, 21 and  
22.

Nos. 20, 21 and 22 are short strain rod and stringer trestles, between Everett Station and North Akron. They are of the same character as like structures on this road already described in detail. They have no guard rails.

No. 23, trestle,  
over Cascade  
flats.

No. 23 is a 30 feet span trestle, 480 feet long, over Cascade flats in Akron; in style of construction and dimension of parts it is the exact counterpart of the trestle No. 14, crossing Peninsula flats. It appears to be sound in every part, except the sills and posts at the north end, which need attention. The south half of this work rests on pile bents.

No. 24, Howe  
truss deck,  
Ohio canal.

No. 24 is a Howe truss deck bridge over the Ohio canal. It is in the middle of the trestle No. 23, and separates it into two nearly equal parts. It is 58 feet long, strong and well built, and timbers in good condition.

No. 25, Howe  
pony.

No. 25 is a Howe (pony or half) truss through bridge, 62 feet span, over Howard street in Akron. Being a double track bridge, it has three trusses. The lower chord of the outer trusses measures  $20\frac{1}{2}$  by 12 inches (or  $6\frac{1}{2}$ , 8,  $6\frac{1}{2}$  by 12 inches), and that of the center truss, 24 by 12 inches (or 6, 6, 6 by 12 inches). The track stringers, 4 by 14-inch oak timbers, which rest on suspended floor beams, measuring  $7\frac{1}{2}$  by 14 inches, and placed 2 feet apart, support the iron rails directly and without the intervention of ties. The entire space between and on each side of rails is floored, for convenience of foot passengers, with 2-inch plank. The second track is only a side or switching track. For double track, on the main line, it would be too light in construction. Situated as it is, only a short distance from the passenger depot, trains necessarily pass over it at a low rate of speed.

No. 26, strain  
rod.

No. 26 is a single span strain rod bridge, 30 feet clear span, and resting on good stone masonry abutments. It is between Akron and East Akron station, and an overhead crossing over Furnace street.

No. 28, strain  
rod.

No. 28, also a strain rod 3-span trestle, having one pile and one frame bent, double, 8 by 16-inch track stringers, and two  $2\frac{1}{2}$  iron truss rods. The ties are 4 by 6 inches, and 10 inches apart, with 6 by 8-inch wooden guard rails bolted to them. One of the track stringers in this structure is beginning to suffer from decay and needs attention. Otherwise the timbers throughout are in fair condition.

No. 29.

No. 29 is like 28, a 3-span strain rod trestle, having new, recently driven pile bents for supports.

No. 30, trestle.

No. 30 is a 15-span trestle, resting on pile bents for supports; spans averaging 15 feet center to center of supports. The track-stringers are two, 8 by 16-inch timbers. Ties and guard rails, etc., as usual on like structures.

Nos. 31 and 32,  
Howe  
through.

Nos. 31 and 32 are low Howe truss double track through bridges, over Little Cuyahoga river. They have stone masonry supports, and are 60 and 45 feet in clear span. In these the two exterior trusses are the stronger ones. No. 32 has no guard rail. The second track on each

of these bridges is a side, or switching track. The timbers of No. 32 are old and decaying and require renewal.

No. 34 is a 15-span trestle, between Krumroy and Uniontown. It appears to be one of the oldest structures on the road, and needs very much the thorough overhauling, which it is now receiving; workmen being engaged on this at the date of my inspection. Details, relating to this, together with a number of other works on this road, having been referred to in previous special reports, are not again mentioned here.

From the trestle No. 34, between Krumroy and Uniontown, and the terminus of the road at Canton, a number of small single span—from 18 to 20 feet span—bridges which were not examined, except the last two near Canton, which were found to be in good condition, and in style of construction like similar ones already described in detail.

Want of time did not admit of an examination of other matters of interest relating to this most excellently managed road. The facilities furnished me by the General Manager, in making my inspection, aided me very much in my work. The copy of the "Inspection Report of Bridges of the Valley Road," made monthly by the Bridge-master of the road to the General Manager, which was sent to me from your office, is evidence of the close supervision exercised by the General Manager over this part of his road.

## XII. THE CLEVELAND, COLUMBUS, CINCINNATI AND INDIANAPOLIS RAILWAY, from Cleveland to Dayton via Delaware and Springfield, and from Union City, Ind., to Galion, Ohio. Inspected July 26, 27 and 28.

This road takes rank among the first railroads in or passing through the State as regards the condition of its road-bed, ballast, track, and equipment. All its recently built or renewed bridges and trestles are not only up with but even in advance of the present accepted standard of such works.

### 1. Cleveland to Columbus.

Between Cleveland and Columbus, a distance of 137 miles, there is found one low (half) Howe truss bridge, containing two 40 feet spans, between Shiloh and Shelby Station, and one near Cardington of a similar description, containing a single span, 55 feet long.

All other bridges on this part of the road are iron truss, iron girder, or stone masonry arches.

The standard floor system on these bridges is: 8 by 14-inch floor beams (in the Howe truss bridges referred to), placed 21 inches from center to center; track-stringers, one, 12 by 12 inches, under each rail, and one, 6 by 12 inches, as an end bearer under each guard rail.

Ties, 6 by 8 to 9 inches, and 7 inches apart. Height of truss, 8 feet.

There are two sets of guard rails, one, 6 by 6 inches, placed 8 inches outside of track, and one at the end of ties, which are 12 feet long.

### 2. Cincinnati Division, Delaware to Dayton.

At Delaware, on the Cincinnati division, there is a four-span wooden Howe truss covered deck bridge, nearly twenty years old. The spans are 54½ feet clear, and the bridge rests on stone masonry abutments and

piers. The truss height is 12 feet. Lower chord in three parts, 5, 12, 5 by 10 inches; upper, same width, 9 inches deep; main braces, two, 9 by 6 inches; counters, two, 5 by 6 inches; and tie rods, two, each  $1\frac{1}{2}$  inches diameter. The bridge timbers, notwithstanding their great age, appeared sound to a careful examination, which must be largely due to the protection afforded by the roof and side sheeting which shelter them.

White Sulphur  
Station, Howe  
deck.

At White Sulphur Station there is another two-span wooden Howe truss deck bridge, covered on top and sides, which is also reported to have been built in 1862. Height of truss in this is 20 feet; length of spans, clear, 120 feet. (My notes, taken from measurements made by me, give 12 panels, each 10 feet long; the company's inspection-sheet gives: total length, 300 feet; clear span, 142.6 feet each. Since noticing this discrepancy, I have had no opportunity of comparing or revising my measurements). The end main braces are  $8\frac{1}{2}$  by 11 inches; counters, throughout, 8 by 8 inches; end tie rods, four in number, each  $1\frac{1}{8}$  inches in diameter. Lower chords, 6, 7, 7, 6 by 14 inches. There is the usual wooden guard rail outside of tracks, and also here an inner one of railroad iron. The bridge rests on stone masonry abutments and pier.

Milford, deck  
Howe.

At Milford, crossing Darby creek, is another 2-span covered deck Howe truss bridge, which, in style of construction and dimensions of principal parts, is almost an exact counterpart of that at Delaware. This was built in 1862. It rests on a stone pier and stone masonry abutments. Its timbers appear to be sound, and a careful examination developed no specific points of weakness anywhere.

South of Mil-  
ford, Howe.

One mile beyond Milford, south, there is a single span Howe truss bridge of 60 feet clear span, which was built in 1877, and is, in dimension of its parts, like the bridge at Delaware.

Nos. 9, 10 and  
11.

The bridges numbered 9, 10 and 11, between Mechanicsburg and Moorefield, are to be replaced with new ones soon.

Mad river,  
Springfield,  
Howe deck.

Crossing Mad river, at Springfield, is a 2-span Howe truss deck bridge; spans being 142 and 98 feet long, respectively. It was built in 1873, and is in good state of preservation. In the long span the lower chords are 6, 7, 7, 6 by 13 inches; end main braces, double, 11 by 9 inches; counters, in center panel, 10 by 8 inches, and tie rods from 2,  $1\frac{3}{4}$  inches diameter in center to 3, two inches in diameter at ends. The entire floor system as in other bridges on this road.

One mile  
further, Howe.

One mile further on, towards Dayton, there is another 2-span Howe truss bridge, in arrangement and dimension of parts like that just described. It also crosses Mad river.

No. 21, Howe,  
Mud run,  
near Osborn.

No. 21 is a very old, low Howe truss, over Mud run, near Osborn Station. Its chords, web members and ties are considerably affected by decay. It needs attention and renewal.

The remainder of this road, from Dayton to Cincinnati, was assigned to another member of the commission for inspection, and will be reported on by him. My notes begin again with the Indianapolis Division, at Union City, and extend from there to Galion.

### 3. Indianapolis Division, Union City, Indiana, to Galion.

Road-bed.

The road-bed, ballast, track and ties on this portion of the road are in very good condition throughout, and in many places even better than on the line from Delaware to Cincinnati.



There is on this portion of the road a greater number of wooden Old bridges. bridges, and some of them, although evidently well watched and cared for, and disclosing in a careful inspection no perceptible points of yielding or of weakness, have reached an age beyond which theoretical calculations of strength, deduced from dimensions of parts subjected to strains, must necessarily become untrustworthy. It is the policy of the management of the road, to remove and replace all these as soon as possible, and in fact, not only these old wooden structures are marked for renewal, but also a number of iron truss bridges, which were to all appearance safe and sound, and exhibited no visible defect of arrangement of parts, were pointed out as being subject to condemnation, because, in the judgment of the officers of the road, they were not deemed to be sufficiently strong to bear much longer the increasing heavy traffic of the road. I desire to invite your special attention to this circumstance, as no better evidence can be adduced to show the attention given by the C., C., C. and I. Railroad to the security of its structures. If further evidence were required, it could readily be found in the fact that thousands upon thousands of dollars are invested for the safety of passengers in the floor systems of bridges on this road, where heavy ties are laid, from 4 to 7 inches apart, and double guard rails placed alongside of the track throughout the entire length of the bridges or trestles, thus affording all possible safety to a train in case of derailment from any cause, while passing over the bridge. In this important feature of bridge construction the C., C., C. and I. Railroad is alongside of the leading roads of the State, and ahead of some, in other respects excellent railroads, that came under my observation.

The first important wooden structure going east from Union City is near Versailles. It is a six-span wooden trussed girder; spans are from 23 to 24 feet clear; the girder consists of three pieces of oak timbers, 4, 8, 4 by 18 inches, in section trussed with two 1½-inch rods. These serve as track-stringers. The end or guard rail bearers are single, 6 by 18-inch beams. The girders are supported on good stone masonry piers and abutments, and break joints over corbels, which are borne directly by the wall plates. Ties and guard rails are as usual. The timbers are old, but give no indications of loss of strength from age or decay.

Near Houston Station is a two-span Howe truss deck bridge, built in 1877, clear length of each span being 76 feet. It has eight panels, each 8 feet 6 inches long; height of truss, 13 feet 4 inches. Four sets of sway braces. End main braces, two, 8 by 9 inches; counters, 6 by 6 inches; end rods, two, 1½ inches diameter. In other respects like bridges of its class previously described.

Crossing the Miami river at Sidney is a three-span wooden Howe truss deck bridge, whose spans are 71, 156 and 156 feet long, and in the clear 61, 147 and 147 feet. The long spans are as follows: sixteen panels, each 9 feet 8 inches long; truss, 16.8 feet high; lower chords, 30 by 15 inches, or four pieces, 7½ by 15 inches. End main braces, two, 11 by 12 inches; rods, two, 2½, and one, 1½ inches diameter; counter braces, 8 by 10 inches to 8 by 8 inches; end posts, four, 7 by 12 inches; end tie rods, two, 1½ inches diameter; sway braces, five sets, 7 by 9 inches; lower laterals, 6 by 6 inches, with 1½-inch rods. The floor system is the usual one on this road. By comparison with many other bridges of this length

of span I find the dimensions here given larger than is usual. The oldest portion of this bridge was built in 1877, the last in 1879. There was found in this one broken angle iron. All parts were found well preserved.

**XIII. THE EASTERN OHIO RAILROAD, from Point Pleasant, a station on the Cleveland and Marietta Railroad, to the town of Cumberland, in Guernsey county.**

This is a local road, eight miles long.

**Grade.**

Very little attempt at establishing a grade seems to have been made. The country through which the road passes is nearly level, and in this particular the road-bed is scarcely distinguishable from it.

**Ballast.**

The road is not ballasted; ties are light, irregularly spaced, and many are decayed and broken.

**Bunching up of ties.**

This irregularity of spacing or "bunching up" is especially observable on trestles where the distance between ties was in some cases fully three feet. The track is laid to the standard gauge.

**Rail.**

It is a forty-five pound iron rail, in good condition, and well preserved as regards wear, but owing to the uneven character of the road-bed, and inferior supporting capacity of the ties, badly out of line and surface.

**Trestles.**

There are no "open" bridges, but it has six trestles from forty-five to one hundred and five feet in length, with fifteen feet span, as a standard, between points of support, which supports are, except in one case, timber bents of the usual style, namely, with two vertical and two batter posts, resting on a ground sill, and surmounted by a cap on which the track-stringers rest. The sills, posts and caps are oak timbers, 10 by 12 inches, and in some cases, 12 by 12 inches in cross section. Track-stringers are single hewn oak beams, 12 by 14 inches, except in one case where the span over a narrow water-course is nineteen feet, and the track-stringers are doubled under each rail. One of the six trestles mentioned has pile bents. The timbers on all these structures are sound, and in fair condition. The traffic of the road is light, and trains run at a very moderate rate of speed. The trestles are, however, insufficiently braced, both laterally and longitudinally, and the entire absence of guard rails, together with the great interval between ties, renders them insecure in case of derailment and other accidents to trains while passing over them. At date of inspection the road was about to be sold to a company which was then engaged in making it a link in a road from McConnellsville north-eastward to a point on the Baltimore and Ohio Railroad.

**XIV. THE COLUMBUS AND HOCKING VALLEY RAILWAY, from Columbus to Athens, including Straitsville and Monday Creek branches.**

**Management.**

This road is, in its appointments and general running condition, of a very high order. In its management there is evidence of a close and intelligent supervision from above, not only of general affairs but also of details. In fact it would be almost impossible to transact the enormous business of this road under any other system than the prevailing one, which aims to keep road-bed, track and rolling stock at all times in the highest state of efficiency.

Of its bridges and trestles I can say that, with the exception of the floor systems, ties, guard rails and stringers of a few between Lancaster and Columbus, and of several short trestles in the line through the coal regions, all were found sound, solid, and in good reliable condition. In the exceptions mentioned the ties principally were old, somewhat decayed, and too light, and too far apart. I was informed, however, that the entire reconstruction of the floor system of these bridges was in contemplation.

General condition of bridges and trestles.

The three wooden Howe truss bridges crossing the river and canal at Columbus are among the oldest on the line. They are now being overhauled and adjusted to the increasing heavy traffic of the road.

Columbus, Howe trusses.

Over Big Walnut creek there is a 153 feet span combination truss bridge, built in 1871. Depth of truss is 20 feet. Lower chord, center panel, eight bars, 3 by  $\frac{3}{4}$  inches; upper chord, wood, 6, 9, 6 by 14 inches; main braces, end two, each 3 $\frac{1}{2}$  by 1 $\frac{1}{2}$  inches; pins, 2 $\frac{3}{4}$  inches; ties, 5 by 8 inches, and 8 inches apart; one inner guard rail of railroad iron, and one outer one of wood, 4 by 6 inches.

Big Walnut creek, combination truss.

Over Little Walnut creek is a wooden Howe truss deck bridge, 120 feet span, built in 1874. Ties on this are 4 by 10 inches, and 5 inches apart. It also has a 4 by 10-inch outer guard rail of wood. End main braces are double, 7 by 9 inches; and end tie rods, two, 1 $\frac{3}{4}$  inches diameter. Height of truss, 13 feet. Lower chords, 5 $\frac{1}{2}$ , 13, 5 $\frac{1}{2}$  by 13 inches; and upper, 5 $\frac{1}{2}$ , 13, 5 $\frac{1}{2}$  by 11 inches.

Little Walnut creek, Howe deck.

At Carroll is a single span iron Post truss, bridge built in 1872. The floor on this is in bad condition, ties being much decayed. Assurances of its early renewal were given.

Carroll, Post truss.

Two wooden truss bridges of the queen-post pattern, located at Hunters' and Peters run, near Lancaster, are soon to be replaced by iron or combination bridges.

Queen-posts, n'r Lancaster.

Over the Hocking river, west of Lancaster, there is another combination bridge, 80 feet long. The detailed dimensions of this and all other important bridges being given in other reports, and tabulated statements will not in all cases be repeated here.

Hocking river, west of Lancaster.

In the two-span iron bridge over the Hocking river and canal at Lancaster two castings of the bridge seat on center pier are fractured. This does not, however, in any way affect the strength of the structure. On this bridge also the floor system is old, and needs early renewal, and the same may be said of the combination bridge No. 28, over Hocking river just beyond Lancaster.

Iron bridge, Lancaster.

The principal remaining bridges on this line are an 83 feet span combination bridge at Sugar Grove; one 182 feet span iron bridge at Buckeye Mill, a very fine structure, built in 1873; a 2-span Howe truss bridge at Carpenter; a single span iron bridge at Logan; a 2-span Howe truss bridge at Lick Run, and similar ones at Nelsonville, and one near Athens; all the above over the Hocking river, and all in good safe condition. There are also between Lancaster and Athens several short span queen-post truss bridges, which are now being replaced with stone arch culverts. Between Columbus and Carroll there is also a stone arch bridge, which is as fine a specimen of first-class stone masonry as came under my observation in any part of the State.

Other bridges.

The Straitsville and Nelsonville coal mine branches, being used principally for coal freight traffic, do not seem to have the solidity of

Branches.

Trestles. road-bed, and close attention to details of ties, ballast and rails, that characterize the main line. The new and recently completed wooden Howe truss bridges on the Monday Creek and Sand Run branches, are models of neatness, solidity and strength. On the older portions of this part of the road, from Logan to Straitsville, for instance, there are a number of short span trestle and trussed beam bridges, which, I was informed, were soon to be replaced by longer span iron or combination bridges, not because they were deemed unsafe, but because they did not afford sufficient water-way in times of freshets in the hilly portion of the country, through which the small streams which they span run. In these smaller structures of the trestle class, ties are laid from 16 to 20 inches from center to center, and the guard rails are light and usually spiked, and not bolted to the ties.

XV. THE COLUMBUS AND TOLEDO RAILWAY, from Columbus to Toledo direct.

This is one of the roads of the Hocking Valley system, and though under the same general head, its management is a separate department of the system.

Road-bed. The road-bed and right-of-way are in excellent condition; drains kept clear, and embankments receive constant attention, the aim being to widen them along the entire line at the top, and leave a space of several feet between the foot of the ballast slope and the edge of the bank. At each regular station on the line there is, in addition to the usual side tracks needed for local traffic, a "passing track," capable of containing 30 cars, always kept clear for the purpose of passing trains without any or the least possible delay. At short intervals along the road, especially between Columbus and Marion, are accommodation sidings, sidings between stations, for the convenience of shippers from these points, and it appears, that in this and many other respects, exertions are made by the management to make the road a convenience to the public directly concerned in it.

General condition. The northern portion of the road, having been but recently opened, is in parts somewhat rough and unsettled, although well tied and fairly ballasted. The older and settled parts of the road-bed compare in solidity and smoothness favorably with any of the good roads of the State. In the fences from Columbus to Toledo there was, except at stations where none could be expected, but one break of a few panels, which had evidently been burnt away a very short time before. The railroad telegraph poles along the road are numbered and placed at equal intervals, so that by observing the numbers and making a very simple mental calculation, the distance of any point from Columbus may be ascertained to within a small fraction of a mile. Although, for the public a matter of curiosity only, it must be a great convenience to the officers of the road in locating, with the utmost exactness, points requiring the attention of workmen along the road, and for such like purposes. At date of inspection I was informed, that of the 118 miles of road 72 were laid with 60-pound steel rail. About ten per cent. of the road is ballasted with broken stone, the rest with gravel. More broken stone is now being put on.

The only long trestle on this line is the one at Delaware, O., which is substantially built, well braced, longitudinally and transversely. A large number of smaller trestles along the line are soon to be filled, and several of the shorter bridges to be rebuilt and replaced by new ones of different style of construction. The details of the principal iron bridges at Columbus and Pemberville will be given in the tabular statement, and are not further referred to here. For the reasons given, namely, changes under way and in contemplation, descriptions of structures, likely to be soon removed, are also omitted.

Delaware,  
trestle.

Altogether, the impression left by the inspection of this road was most satisfactory, and the efforts of the officers, who have brought it, new as it is, to its present efficiency and condition, are deserving of acknowledgment.

#### XVI. THE OHIO AND WEST VIRGINIA RAILROAD.

Also one of the Hocking Valley system, extends from Logan, Ohio, via McArthur, Gallipolis and Pt. Pleasant to Pomeroy, Ohio. It is, I believe, under the control of the same management that has charge of the Columbus and Toledo road. The inspection of this road was made July 18 and 19.

Having been but recently completed, or rather opened to traffic, for the officers of the road do not admit that it is completed, it is in some respects in a crude condition. This applies more particularly to condition of road-bed, ballast, and the partly unfinished state of many trestles toward the southern end of the road. Some of these are still unprovided with guard rails, and are also wanting in respect to a good system of transverse and longitudinal bracing. In nearly every case, however, that came under my observation, where these criticisms would apply, it was apparent that exertions were being made to correct them. Absolute impossibility to obtain the requisite material fast enough for the requirements of the road, was given as a partial reason for the unfinished state of some structures, and also the great local pressure brought to bear upon the authorities controlling the road, to have it opened to the public much sooner than was originally contemplated.

General con-  
dition.

The structures being all new, their timbers are of course all good and sound.

There is one two-span combination Pratt truss bridge over the Hocking river at Logan; one also of two spans at Hawks, over Raccoon creek. All the other bridges are Howe truss wooden bridges, except a short span Queen truss bridge over Five Mile Run, near Logan.

Logan, Pratt  
truss.

The following are the standard dimensions of some principal parts of wooden bridges:

Standard di-  
mensions of  
bridge mem-  
bers.

Over Old Town creek at Logan, 50 feet span, low Howe truss. Panel length, 7 feet 3 inches; depth, 8 feet 1 inch. Lower chords, 6, 8, 6 by 12 inches; upper, 6, 8, 6 by 10 inches. Ties, 5 by 8 inches, and 18 inches center to center. End main braces, 8 by 8 inches. Counters, throughout, 6 by 7 inches. Tie rods, two, from  $1\frac{3}{4}$  to  $1\frac{1}{2}$  at center. End posts, 5 by 10 inches. Floor beams, 7 by 14 inches, and 20 inches from centers. Stringers, single, 10 by 10 inches. The other low Howe truss bridges, ranging from 40 to 60 feet span, vary very slightly from the above.

Vinton, Howe  
truss.

At Vinton, over Raccoon creek, there is a 150 feet span Howe truss bridge of the following dimensions:

Number of panels, 14; length, 10 feet 3 inches; height, 23 feet. Lower chords, 7, 7, 7, 6 by 15 inches; upper chords, 7, 7, 7, 6 by 13 inches. End main braces, 9 by 11 inches. Counters, from 9 by 9 to 7 by 9 inches. Tie rods, from three, 2 inches diameter to 1½ inches diameter. Floor beams, 6 by 12 inches, and 22 inches from centers.

Tunnels.

There are two tunnels on this line; one near Eagle Furnace, 275 feet long, and one near Campbell, 875 feet long; both have natural rock roofs.



# RAILROAD ECONOMICS.

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During the work of the Inspectors some notes of a general character, taken by Prof. Robinson, suggested many questions of practical import to the railway management of the State, as well as railway management in general. The Professor was requested to expand these as much into detail as his time would permit. The following considerations upon railroad economics is the result.

By request, as a member of the American Society of Mechanical Engineers, the Professor read a part of it before that society, which they afterwards published in their transactions.

Parts of it were, also, afterwards published in the May and July numbers of Van Nostrand's Engineering Magazine, and since then the publisher, Van Nostrand, has incorporated the same into the "Science Series," No. 59, of hand-books for engineers.

COMMISSIONER OF RAILROADS AND TELEGRAPHS.

# RAILROAD ECONOMICS,

BEING NOTES AND OBSERVATIONS FROM THE TOUR OF INSPECTION;  
AND REMARKS BASED ON THE STUDY OF RAILROAD METHODS  
AND APPLIANCES.\*

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By S. W. Robinson, C.E., Prof. Mech. Eng. Ohio State University, Member of the Board of Inspectors.

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## TRUNK AND OTHER LINES.

Ohio, more than any other State, has, crossing its entire breadth from east to west, numerous great trunk lines of railway. These constitute a very important portion of the existing means of communication between the east and west. Other roads of the State having largely, or altogether, local interests, run mostly north and southward. Strong companies control the former, while the latter often fail to pay well enough to keep up repairs. Many of the latter roads appear to have been built before counting the cost of maintenance. The fact that ties, culverts, cattle guards, trestles, uncovered wooden bridges, and even iron rails have a life in railroads of only 6 to 10 years, argues strongly, indeed, undeniably, to the truth that a new road, excepting its road-bed, must be rebuilt in about 10 years. A company ignoring this fact will be likely to cripple within 10 years, unless its road is an unusually profitable one; such a road finally comes to the necessity of selling or leasing its interests to a stronger company. The strong company or trunk-line then puts the road into good running condition, sometimes to form part of a through line, sometimes a branch, and sometimes to form a tributary to it. In this way a road of secondary importance may be kept up to good running condition, while otherwise it would go down.

Whatever may be said against consolidation of railroads, it appears to be a fact that roads owned by strong and wealthy companies are in far better condition than otherwise. Indeed the generally good condition of the great trunk-lines and of their branches is a credit to those companies. If these roads are backward in some things, such as introducing the best systems of "signaling," "blocking," and of "interlocking apparatus," they are certainly up in other matters, such as steel rails, iron bridges, etc.

## CONSERVATISM.

The conservatism of railroad officials is probably to the advantage of the traveling public. If every new patent were hastily put into practice the deluge of new ways and means might bewilder the road operator, or baffle the train men, until all are destroyed. Most roads not only wait till a thing is proved, before adopting it for use, but even make sacrifices for safety. Thus the air brake had a hard fight before

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\* A portion of this article was presented to the American Society of Mechanical Engineers in a paper read at the annual meeting in New York, November, 1881. Portions have also been published in periodicals, notably Van Nostrand's Eng. Mag.

adopted on the first road, but now it is an acknowledged necessity for safe travel. It appears, however, to be an expensive luxury, because the appliances are costly, and brakemen sufficient to operate the brakes usually accompany the air-brake-fitted trains. Hence, here is an expenditure for safety, which was not adopted till proved. Again, it has been demonstrated that the "loose wheel," or "independent wheel" system, where one wheel is loose on the axle, or each wheel has a separate axle, can be employed with a very appreciable reduction of the tractile power at railroad curves, and consequently with a saving of coal, wear and tear of engine, and of rails and wheels; but these systems are not proved to the satisfaction of railroad men to be as safe as the ordinary system of two wheels absolutely fixed to a single axle. Nobody dreads accidents more than railroad men, though their dread and that of passengers is perhaps from different motives. In no business is such extreme and intense caution exercised as in the running of railway trains.

#### SAFETY.

A little attention to railroading will suffice to show that safety in railroad travel is the price of incessant vigilance. That a stretch of three hundred miles, extending across a State is, every foot of it, perfectly safe to-day, is not proof positive that it will be so to-morrow, though the broken rail or washed culvert is the subject of constant search. Every wheel touches every inch of track, and every inch must be in order. No single one of the hundreds of culverts or cattle guards can be permitted to become deranged, or weak with age; indeed, not a single piece of any of them, because each piece has a part to serve. No stick or rod is put into a bridge without a purpose. In a bridge of 100 feet span there are about 100 important members, or one to the foot in any span, the failure of any one of which would precipitate a passing train to the bottom. An engineer, in examining a bridge wreck for the fault, usually looks for it in some one piece. Considering the difficulty of producing perfect parts of iron bridges, especially as to quality of the material (see testing and selecting material), it appears that a safe bridge can only be the result of the most rigid requirements on the part of railroad companies, and the most scrupulous care and watchfulness on the part of builders.

But it is not sufficient that a structure be all right at erection, especially when of wood. The road must institute and maintain a thorough and never-ceasing system of inspection, such as will detect decay of wood in the interior of any single piece, a beam or post. Points difficult of access must be examined, from the top of the structure to a reasonable distance below earth surface. Some structures, such as a farmer's barn, is all right till it falls; but this test of old age can not be applied in a railroad structure. It must be renewed when yet it might do more service.

The first object must be safety; then elaboration, elegance, etc. For instance, our best roads do not hesitate to doctor a lame wooden bridge by placing a trestle bent under for support, if from any cause the road-master believes the bridge is in the slightest degree unequal to its task.

#### PROTECTION OF RAILROAD STRUCTURES.

The life of railroad plant is not great. New roads, with iron rails and wooden structures, will need renewals for the most part within ten years. Rails endure according to traffic, and for light traffic will run ten years. Ties will rot out in from

five to eight years. Culverts, cattle guards, etc., about the same. Good wooden bridges, when new, will be dangerous in ten years unless covered. If covered at all it should be done within two years after building, otherwise the timber becomes affected with dry-rot at the heart. This decay might perhaps better be called *blind-rot*, because it is hidden. A wooden bridge, nicely covered and painted, may *appear* to be in the best of condition, but really be in the very worst. Joints in the lower chord of such bridges are seen to be pulling out by the locks splitting off. In such cases, when the timbers are sounded with a boring-bit, the latter will find sound wood for 2 or 3 inches, when suddenly the bit may take a jump of 4 or 6 inches through a dry-rot hole. Such well-covered and well-appearing bridges are found not to have been covered under three years or more after building. Equally good uncovered bridges, even better, ten years old, have been found than those of equal age, well covered, in which the covering was delayed three years. It appears that after three years of exposure to open weather, a bridge is doomed to a life of only about ten years, covered or uncovered.

But by prompt covering of wooden bridges the life is more than doubled, from which it appears that the practice of covering such bridges is highly economical. For instance, certain wooden bridges promptly covered and well cared for have been found in excellent condition at the age of 20 years. Others, covered after 3 years, have been found heart-rotten at 8 or 10 years.

It is sometimes the practice to cover simply the trusses, and it is necessary in "half" Howe or "pony" trusses of wood. This leaves the floor system exposed, and any sap wood about the floor-beams or the stringers is soon eaten away with decay. Sap is of but little worth after three years exposure, even when free. But heart wood is often perfectly sound at ten or fifteen years. Sap wood is so comparatively worthless that some engineers specify that not over 8 per cent. of section of timbers shall be sap. It is an excellent precaution to thus limit the sap wood, because it is practically of no value. In existing bridges sap wood rot has reduced the section of chords, as estimated, from 10 to 20 per cent., the remainder being sound. Uncovered flooring should, therefore, be watched, and when the beams are found weak, as by observed excessive deflection, new beams should be added.

Painting is an excellent practice, and its power for prolonging the life of wood is not confined to free or external surfaces, but internal as well,—that is, to illustrate, lower chords have been examined where the wooden "clamps and keys" were laid in white lead, or sometimes in red lead, and such are sound and strong to a greater age than unpainted.

A close joint in wood, where exposed, is far worse than open joint of small space sufficient for air to pass. From this fact it appears that wood contacts have been avoided by using iron "clamps and keys" in lower chords. Some engineers make iron clamps or blocks with a space for ventilating between wood and iron, the bearings being quite narrow. These have given good results, and point to the value of ventilation.

As to ventilation in general, all coverings should leave the main bridge timbers free for air to circulate about them. For instance, the boarding along the sides of trusses should be firred out by girt strips being nailed to the truss along the braces above the lower chord and below the upper chord, and not on the chords themselves. Then, when the boarding is nailed upon these girts, it stands out free, so that air can freely go all about the chords.

One matter not to be overlooked in covering bridges is accessibility by the company's inspector. Room should be allowed under the cover for him to reach every piece to examine it. Doors for entrance may be kept locked, or held by screws.

In some instances chords have been found covered with tin, the same being fitted about the braces and nailed to the chords, so as to appear like giving protection to the chords beneath. But this is believed to be worse than no covering whatever, from the simple facts that, first, water will work in at the numerous joints, and, second, be held there by the tin covering. If the tin could be carried away from the wood by a 2-inch space, the latter being allowed for ventilation, it will serve a good purpose when it is made tight. These conditions are readily met in "combination" bridges—that is, in such as have wood upper chords, braces and end posts, but with iron ties and lower chords. The upper chords are readily covered with tin, because nothing protrudes above to prevent. The braces, or vertical pieces generally, do not need covering, as it is found that the wet so rapidly escapes as to leave the braces soon dry.

Special pains should be taken to keep wet out of close places in wood. For instance, in deck bridges (Howes), water is apt to leak through the roof, as it is difficult to lay a roof among the ties, floor-beams, string, etc., in the floor system and get it tight. In such cases the sway braces are apt to carry the water which falls upon them down upon the lower chord. This has been avoided very neatly, cheaply, and efficiently on the Lake Shore & Michigan Southern Railway, by making a saw cut across the top and edges of the sway braces, and driving in a collar of sheet-iron or tin, which extends down like spurs below, and thus heading off any water which may find its way through the floor or roof above, and alight upon the sway brace to come trickling down. The same practice has been observed on other roads.

But though tin may be suitable to cover upper chords, as above explained, with reasonable durability, yet as a main roof covering over the tops of Howe bridges it appears to be utterly worthless, for the reason that the sulphurous fumes of the smoke from the locomotive soon eats the tin roof through like a big pepper-box lid. Indeed this action has been observed upon heavier masses of iron than tin; the truss rods even having been observed in badly rusted or pitted condition, with a weakening of probably 5 to 10 per cent. The latter has been observed to be most serious in low lands, such as would be frequented by fogs. The moisture of the latter deposits upon the rods and absorbs the acids of the smoke. The iron is then etched more or less seriously. Indeed, rods have been found with deep porous crusts of rust, resembling anchorice in structure, standing out over the surface of rods. Rods for such localities should be made with some excess of section to provide for the corrosion.

A suitable material for the roofing of full covered bridges is quite a desideratum. Tin corrodes, iron rails rust out, tarred paper blows off in storms, and from blasts of the smoke stack matched boards check to pieces, and are loosened by the corrosion of the nails. Some believe a double course of matched boards, breaking joints, is the best.

#### WOODEN BRIDGES.

The prevailing wooden bridge is the Howe truss. It consists, as generally put up, of an upper and lower chord, connected by vertical tie rods running throu

with nuts at both ends; the latter dividing the span into panels containing braces and counter braces. The chords usually are made of four sticks, side by side, with blocks or "keys" notched in, but leaving a space between all. Chord bolts run through from side to side of chord to draw all together. In short chords the sticks run from end to end. But for lengths greater than about 40 feet, pieces are put in so as to break joints. In upper chords these simply abut against each other, but in lower chord clamps are used to make tension splices. These clamps are generally of oak wood, and preferred by some builders of the first and by some of the second form in Fig. 1:

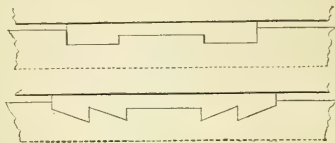


Figure 1.

Sometimes only one is used to a splice, as shown, particularly the outside members of the chord, but more often two, one on each side of pieces joined for inside members. A chord bolt goes through near each end of a clamp. The earliest point of failure in a wooden bridge is at the locks of these clamps, either on the clamp itself or on the interlocking hooks of the chord.

Two of these splices are never found opposite in a chord, but break joints, so as to allow one joint to each panel. In this way the so-called keys help to form the splicing. There are always two main braces, and one counter brace between, in each panel. The former always incline toward the midspan point. In moderate spans there are always two tie rods at each inter-panel point, but in long spans there may be three at the ends of truss. The largest of these rods are 2 inches in diameter: almost always threaded without enlargement of ends. These ties draw against straps on the outside of the chords, running from 1 by 5 down to  $\frac{1}{2}$  by 3 inches in section, and long enough to extend the width of the chord. The braces almost always set square against iron angle blocks. The best of these blocks have flanges to prevent the braces from falling out of place. These blocks are often found broken, but the breakage is evidently due to carelessness in drawing up the tie rods too tight upon the braces, because on some roads these breaks are very numerous, while on others the same make of blocks are never found broken. Road-masters say they find difficulty in getting men to draw their tie rods up properly upon the braces and without excess of strain. Great caution is needed here, as an excess of tension on the tie rods produces a strain in the lower chord, such as tends to strip the splicing.

The depths of these trusses vary. Short spans, or "pony" trusses, sometimes also called half trusses, run from about 8 to 12 feet height. Full trusses for longer spans are usually about 20 feet. The smaller trusses have about two or three floor beams per panel, while the larger have four or five. They always rest upon or are suspended from the chords.

When wooden bridges show signs of failure, the speed of trains is often reduced till a remedy is applied, either in strengthening the bridge or by renewing it. Two ways of strengthening a lame bridge are in use. One consists of springing a wooden



arch from the abutments, usually from iron skewbacks, placed about 6 feet down, and rising at midspan nearly to the tops of the trusses. Each case requires four arched ribs, one on each side of each truss. From the arches the trusses are suspended by rods. But this method is too expensive for an old bridge; it is more common for a light bridge otherwise good. The second way to doctor the bridge, and which is very common for old bridges, is to put a trestle bent under at the third or quarter span. A pile bent is sometimes used instead of a trestle bent. The objection to placing the bent at the middle is the fact that the counter-braces near the middle in that case become main braces. But by changing the counters for main braces at the trestle bent for a few panels, the midspan point becomes the best place for the trestle bent. Some less considerate road masters place the doctor at the middle, however, and regardless of the condition of the bracing. As the carrying power of a truss varies inversely as the square of the span, other things being equal, it appears that the strength of a bridge is nearly doubled by placing a support at the one-quarter point. Such trestle bents are carefully watched to guard against washing out by the stream. In high water such a trestle bent is a treacherous affair, a pile bent being far preferable.

The lateral bracing in wooden bridges is almost always about the same, viz., about 6 by 6-inch braces and 1½-inch tie rods, and the same from end to end of bridge. These are usually in the plane of the lower chords and also upper. No difference is made in the strength of the lateral bracing, as far as observed, for straight or curved track, though it is certain that the centrifugal force of a train running on the curved track over a bridge will give cause for lateral thrusts, which are considerably greater than for straight track. One element of compensation, however, exists in the fact that bridges under curved track are usually wider, so as to allow equal clearance room, and this gives wider lateral trussing. Trusses are not found inclined on account of curves on the bridge.

Through bridges of wood have no "sway" bracing. The chords of the trusses are from 24 to 30 inches in breadth, and the floor beams extend entirely over to the outsides. This keeps the lower chord in position. The braces cover about the whole width of the chords, so that the trusses are quite stable in erect position.

Deck bridges always have sway bracing, but in some cases much stronger than others. Where several spans of wood bridges are contiguous, in some cases both or all are made continuous from span to span. In other cases only one chord will be continuous. Diagrams taken, as hereafter explained, have shown that in continuous two-span bridges an appreciable rise of the second span occurs when the train gets fairly on the first.

#### IRON BRIDGES.

The prevailing form of iron bridge is the Pratt truss for long spans, and for short the plate girder. The change from one form to the other occurs usually at lengths of about 60 feet. These statements apply more definitely to recent practice than former. The older iron bridges are very promiscuous, both as regards form and manner of putting together. Some of the first iron bridges in the State were Howe trusses, one of which went down in the Ashtabula disaster. But in place of the latter we now find what is probably the strongest iron Pratt truss in the State, so that people need not now go around Ashtabula to avoid a second catastrophe.

The parts of truss bridges were formerly united in various ways, sometimes by bolts, notches, and locks, and often by riveting in place. But at present the method by pins and eyes prevails, especially for the longer trusses. In upper chords, however, though the tie rods are usually attached by pins, yet for increasing the rigidity they are made continuous by riveting on splice pieces extending past the pin-holes. The forms of parts of bridges, as well as the methods of joining, are almost as though stereotyped. Thus the "eye-bar" is an article of manufacture, and is used in all parts of bridges, except upper chords and struts or columns.

Upper chords and end posts are most frequently made of two channel bars, 12 to 18 inches apart, with webs vertical. They are joined on top by a longitudinal plate extending the whole length, and riveted to the flanges, while the bottom side is latticed or "laced." "Web" members serving as struts are most frequently composed of two channel bars at a distance apart, and connected by diagonal lattice slats riveted on. Sometimes, however, the two channel bars are riveted by their webs to the flanges of an I-beam. Formerly Phoenix, keystone, box, and other columns, nearly or quite closed, were much in use, but they appear to have given place almost entirely to such open columns as above mentioned, simply from the necessity experience has developed of painting every inch of surface in iron bridges.

Most engineers require forms such that a paint brush can touch every part, either inside or out. The advantage of this is seen from the fact above mentioned of the rusting of truss rods, and of tin roofs from moisture and smoke. The statement also, which has come to my notice, that tons of rust have been removed from tubular bridges, is in point.

Floor beams, made by riveting four angle-bars upon the edge of a plate, two upon each edge at opposite sides, are the most common. The section approaches, that of the I-beam. Plates are often riveted on top and bottom, part of the length, to increase the strength at the middle part where the moment of strain is greatest. These beams are most frequently suspended from the pins of the trusses by inverted "U" bolts. But when there is scant room below a bridge, for water-way or otherwise, they are in some cases riveted to the vertical struts.

Though these methods are the most common, various others are in use. One peculiar mode of suspending consists of placing the open intermediate column in a position such that the channel bar webs are perpendicular to the direction of the track line. Then a pin is passed through the channels from side to side of column, at the height to also pass the floor beam end, the latter extending into the space between the channels. This makes a neat and convenient suspension, but it is less convenient for chord connection with column.

The stringers are most frequently of rolled I-beams, though often built like floor beams.

The lateral stiffening is much better attended to in iron bridges than in wooden ones. The lateral tie rods not only vary in size, from end to middle, but differ in size according to span, width, etc. There is generally a lateral system at both the bottom and top chords.

Plate girders are usually formed by riveting angle-bars to the sides of the webs, top and bottom, then across these, a flange. The latter is increased by additional "lifts" laid on in the middle portion. These plate girders are usually of uniform depth, though some have been met in which the upper flange or chord was arched

so as to nearly join the lower chord at the same ends. Vertical stays of angle-bars are riveted on throughout these girders, but nearest together at the ends, their object being to prevent the buckling of the webs. Most usually the two girders of a bridge are joined by riveting to the floor beams, so that all forms a connected system. An angle-plate then is set between the floor beams and girders, to prevent the latter from swaying or careening.

But on some roads many of the plate girders have wooden floor beams; the latter sometimes resting directly upon the lower flanges, and sometimes on angle-bars riveted to the girders. A neat and serviceable small bridge, where there is sufficient water-way, consists of plate girders, about 10 feet apart, with lateral and sway bracings, and upon which are mounted the wooden floor beams, the same being sometimes simply enlarged ties, say 7 by 9 inches, or 8 by 10 inches in section. This plan is carried down to I-beam girders for culverts of 10 feet span or less.

In a few instances weak iron bridges have been strengthened by springing iron arched ribs from the abutments, composed of channel iron, and securing the same to the trusses at a suitable number of points.

At the present day many good iron bridges are found to be too weak. This is due not to any engineering defect, but to the growth in weight of freight loads and rolling stock. We now find 60-ton locomotives; where formerly there were 40 and 20-ton loads per car, where there were 10. Hence, bridges designed to a strain of 10,000 pounds per square inch of iron section, as due to the former loads, must now stand 15,000, or perhaps more. This is unfortunate, since an iron bridge is so difficult to strengthen in a satisfactory manner, and so difficult for the road-men to get renewed.

Expansion and contraction of iron bridges is provided for in supporting one end on rollers. In short spans, however, rollers are dispensed with, and the bearing plates slide. Often the observed expansion reported by bridge attendants does not account for the whole variation of length, even where rollers are in use. It is believed by some that the rolling resistance under so much weight is so great as to spring the piers where piers are tall. Thus it appears that strains, due to constrained expansion, may be too great upon chords to be ignored in calculating total strains.

#### COST OF BRIDGES.

The following figures are presented for the purpose of giving an approximate idea of the cost of bridges of various spans and materials.

## TABLE OF COST OF BRIDGES.

*Exclusive of Ties and Rails.*

Style.	Length.	Height.	Cost per foot.	Authority.
Howe truss, all wood.....	75 feet.	23 feet.	\$21 00	
" " ".....	124 "	23.5 "	29 20	C. L. Strobel, of the Keystone Bridge Works. "
" " ".....	147 "	23.5 "	29 20	
" " ".....	168 "	24.5 "	33 60	
" " ".....	210 "	28 "	47 70	
" " ".....	100 "		19 00	G. M. Reid, of L. S. & M. S. R. R.
" " ".....	150 "		26 00	
" " ".....	150 "		28 00	
Combination with wood floor beams...	75 "	22 feet.	19 40	C. L. Strobel. "
" " ".....	124 "	24 "	24 30	
" " ".....	147 "	25 "	25 55	
" " ".....	168 "	26 "	32 00	
" " ".....	210 "	28 "	40 05	Smith Bridge Co
" " ".....	150 "		32 00	
Iron truss.....	150 "		60 00	
" " ".....	100 "		50 00	
" " ".....	100 "	Double track.	90 00	G. M. Reid.
Plate girder.....	30 "	3½ feet.	22 50	
" " ".....	44 "		25 00	
" " ".....	64 "	5 feet.	42 50	

<sup>a</sup> See article on cost of Howe and combination bridges, by C. L. Strobel. C. E., in the American Engineer for July 1, 1882, page 9.

## ENGINE AND CAR LENGTHS AND WEIGHTS.

The following table of lengths and weights of rolling stock is given for the purpose of conveying an idea of such dimensions in actual use at present.

## TABLE OF LENGTHS AND WEIGHTS.

*In Running Order.*

Kind.	Part.	Length.	Weight.	Authority.
Passenger engine, K.....	Engine and tender.....	59 ft. 6 in.	97,700 lbs.	
" " ".....	Total wheel base.....	47 " 8 "		
" " ".....	On drivers.....		65,300 lbs.	Penn'a R. R.
Freight engine.....	Engine and tender.....	56 ft. 9 in.	147,400 lbs.	
" " ".....	Total wheel base.....	47 " 7 "		
" " ".....	On drivers.....	13 " 8 "	80,500 lbs.	
Passenger engine.....	Engine and tender.....	51 "		P., Ft. W. & C.
Passenger cars.....	Body.....	46 " 6 "		
" " ".....	Total.....	52 " 9 "	44,000 lbs.	Penn'a R. R.
" " ".....	" " ".....	56 " 6 "		
Pullman cars.....	" " ".....	61 " 6 "		P., Ft. W. & C.
Baggage cars.....	" " ".....	46 " 6 "		
U. S. postal cars.....	" " ".....	56 " 6 "		
Freight cars.....	" " ".....	36 " 4 "	26,200 lbs.	Penn'a R. R.
" " ".....	Body.....	34 " 7 "		

## STRAINS UNDER MAXIMUM LOADS.

In proportioning the parts of bridges for resisting their strains, a great variety of detail exists in the present practice. We find no "live" bridge engineer of to-day adopting a fixed maximum load per foot for all spans, even for the same road and the same trains, neither do we find the same practical part of the ultimate or

elastic resistance of the iron adopted for the allowable strain for all parts of any one bridge. The factor of safety is "a thing that was" to such an engineer.

In the first place, the quality of the iron is allowed to differ for different parts of bridges. Tension members are never made of anything but "double refined" iron, that is, iron that has been double rolled. This consists of taking "muck-bars" (the result of first rolling from puddle blooms), cutting and piling them, reheating to a welding heat, rolling into bars, then cutting, piling, and reheating again, when they are rolled to the needed sizes. Compression pieces are single refined, in which the last piling and rolling above described is omitted. Channel bars of columns and upper chords are thus treated.

A fair quality of double refined iron in bars should have a tensile strength of 50,000 pounds per square inch; an elastic limit of 26,000 to 30,000 pounds per square inch; stretch, 15 per cent. in 8 inches;\* bend, 180° around a cylinder of diameter equal its thickness without fracture; and when nicked and broken should show a fibrous fracture. Such iron in the regular truss tension members is usually allowed to be strained to 10,000 pounds per square inch for the maximum load. In some cases floor beams are allowed 8000 pounds only, because they are strained nearly to the maximum allowed for each passage of load. This is true of floor beams, because the greatest load occurs when under the drivers of the locomotive. In the main truss, however, the maximum strains are only reached when the whole train is up to the maximum, a condition which does not happen with every train. The  $\Gamma$ -shaped hangers for floor beams are usually allowed only 5000 to 7000 pounds. Struts and upper chords are computed as columns, and on a supposed basis of about 8000† pounds per square inch. This low value is probably partly due to the fact of single rolling for channel iron.

#### ASSUMED MAXIMUM ROLLING LOAD.

In calculating the maximum strains there are two ways of treating the question of the maximum load.

1st. By adopting the greatest actual train weights, such as two of the heaviest locomotives, followed by a train of the heaviest loaded freight cars; then computing the strains as static effects to which results are added, for "dynamic effect:"

For spans of about 30 feet.....	25 per cent.
"        "        50 feet.....	15 "
"        "        75 feet.....	10 "
"        "        100 and over .....	0 "

2nd. By assuming fictitious train weights which are uniform per foot for the span, but which are much the greatest for short spans. Thus, for some roads on this plan, the assumed load for calculating strains is:

For spans of 10 feet .....	6000 pounds per foot.
"        40 feet .....	4000 " "
"        150 feet .....	3000 " "
"        500 feet .....	2500 " "

\* See results given further on under *testing and selecting material*.

† By a rational formula for columns, given in the appendix to this report, it is shown that this value would be but a little over 6000 pounds, according to the usual assumption respecting columns.

This diminishing scale is to be accounted for as providing, first, for impact; the latter being greatest for short spans, because so much more quickly passed by the forward end of a train, and causing an application of load which is so sudden as to be of the nature of a blow; and, second, because short spans have the locomotive itself for the maximum load, while longer spans can only be covered by adding to the one or two locomotives some portion of the train.

#### CRYSTALLIZATION OF IRON IN BRIDGES.

As regards the deterioration of iron in use by crystallizing, there are differences of opinion and too few facts. One man will present evidence of crystallization, while another will produce equally good evidence against it. It appears that data is too uncertain. When rods taken from a bridge are found to be crystalline, it is not known whether they were not so when put in. But this matter will be settled in due time, because positive data now exists as to the condition of iron in existing bridges. When the future engineer shall examine the parts of these bridges, and compare notes with the former records, we shall know how about crystallization.

In examining iron for crystallization, the manner of testing is important. For instance, in the experience of the writer, bars of iron, which when nicked with a cold chisel and broken with a sledge on an anvil, have appeared very crystalline, while the same bits, thus broken off, when put into a testing machine and drawn apart by tension, have, at the fracture thus produced, appeared *perfectly* fibrous. Also specimens nicked and broken by bending have been found crystalline at that portion of the fracture near the nick, while the other part was fibrous. Thus it seems difficult to predicate the condition of a quantity of iron simply from an examination of test specimens of it. But the deportment of iron, incidentally or perhaps accidentally observed, is sometimes the best indicator of its condition as to crystallization. When a bar breaks in its ordinary handling, as in throwing on or off of cars, the fracture may be expected to be crystalline, and the iron worthless for bridges.

#### STEEL BRIDGES.

We are now at the verge of a steel bridge era, several important steel bridges being already built, and in process of construction. The most important mechanical difficulty in this direction is already overcome in the existence of machinery for the manufacture of solid steel eye-bars. Steel is in every way better fitted for bridges than iron. It is less subject to deterioration, becoming more uniform in results of manufacture, has an ultimate strength of nearly double that of iron, and an elastic limit from two to three times as high. Considering the strength, it is but little, if any, more costly. This step from iron to steel is but the natural course from cast-iron up, which latter material is now entirely abandoned as a material for bridges, except for unimportant members, such as wall plates, packing pieces, etc.

#### SWAY BRACING.

In both wood and iron bridges "sway" bracing is universally employed in deck bridges. But such bracing is held in doubt by some experienced and observing railroad men, except at the ends of the bridge, where it should be especially strong.



The reason given for this belief is that where one truss receives a greater strain than the other from any such cause, as wind against the train, train at one side, as in double track bridges, curved track, etc., each truss should be allowed to remain in a plane. But the sway braces preserve the cross-section, so that if one truss deflects more than the other, each truss must careen to one side to some certain corresponding extent at the mid-span, but not at the ends, because here the solid abutments prevent. This forces the chords laterally out of a straight line, causing horizontal transverse strains upon them. The eye-bars on one side of the lower chord would, under these circumstances, be strained more than those on the other side, an inequality which would disappear in the absence of sway bracing. Not only would the main trusses be affected, but the lateral bracing at top and bottom would be strained unduly, and probably higher than provided for in the oversight of this matter. The old Ashtabula bridge was an iron deck, and who can say to what extent the sway bracings was responsible in the failure of it?

Though the one consideration of greater flexibility of cross-section seems to favor the omission of sway braces, in that we thus obtain freedom from stresses in one system of bracing as due those in another system, yet it is probable that the yielding cross-section will allow the train, while under wind pressure, to be forced to a greater inclination toward the leeward, thus causing a probable greater displacement of the center of gravity of train toward the leeward truss, and increasing the strain on the latter. But the increased strain, due to the careening alone, can only be slight at most, and simple in nature; while the sway braces antagonize the different truss systems, causing crossed and mixed strains of a very complicated nature; which, if not positively endangering the structure, are likely to cause loose and shakily joints at the sway lateral brace connections. Mr. David Lee, master of roads for the B. & O. Railway, in Ohio, is entitled to credit for calling attention to this matter of sway bracing.

#### VIBRATIONS AND STRAINS.

In observing the deportment of a bridge as a swift train passes over, the parts are seen to be much agitated. Tie rods will often fly about at the middle parts to a very considerable extent. This has evidently received some attention by engineers, because in a few instances tie rods at the crossing points have been found tied together, apparently to stop vibrations. That all such vibratory movements cause direct strains in the vibrating parts there can be no doubt; and it is unfortunate that these vibrations cannot be predetermined so that the strains resulting from them can be calculated. Could these be accurately determined, it is probable that the practical maximum working stress for bridge iron in tension could be safely raised from 10,000 pounds per square inch to 15,000 pounds; a margin being still left between the latter figure and that for the elastic limit for indeterminate strains due to such movements as considered below. Even 20,000 pounds might possibly be employed, if all the working strains could be accounted for.

#### LURCHING OF THE BRIDGE.

In some cases the whole central part of the bridge is also in an agitated condition, both vertically and horizontally. There seem to be various causes for this, such as want of perfect balance in the drive wheels and connections, error in perfect

alignment of rails, especially in the vertical plane, wandering of the wheels from side to side over the 1 to 1½ inches of clearance between flanges and rails, irregularity of curves on bridges, tangent points on bridges, etc. In some cases this seems to amount to an oscillatory or vibratory movement of the whole bridge.

#### CUMULATIVE VIBRATION IN BRIDGES.

It is a well known physical fact that rhythmical impulses, though very slight individually, will result in an astonishing cumulative action when applied for a time to a body so circumstanced as to vibrate in equal rhythm. Soldiers, in marching, must break step in passing over foot bridges, else, if the bridge should have a time of vibration equal the time of step, the structure would vibrate seriously. The trot of a dog has been observed to cause a street bridge to vibrate with decided intensity, the vibration being observed to keep time with the dog. Horses in vehicles "must not move over the bridge faster than a walk," for fear the trot and vibration periods shall agree. The child in a swing is able to rise from a low to a high amplitude without help, simply by a tilting motion of the body, so directed that each adds a slight impulse to the oscillatory movement.

Similarly in railroad bridges a slight want of perfect balance of the locomotive drive wheels may cause unexpected vibrations and unanticipated strains when the times of half revolution of drivers harmonize with the bridge vibration time. The likelihood of such synchronism may be rendered more apparent by means of calculated results.

For example, a train moving at the rate of 30 miles per hour, has a velocity of 44 feet per second. Locomotive drivers of 5½ feet diameter make one revolution in about 0.4 second, or a half revolution in 0.2 second.

Now an iron bridge of 150 feet span will weigh about 1,400 pounds per foot. In vibrating vertically, as by placing a heavy load upon it suddenly, the ends at abutment do not participate, while the middle is most active. To get an approximation, without going into refinements as to distributed masses, suppose half the bridge length to vibrate equally while the quarters near the abutments do not vibrate, then half the weight of the bridge will enter into account for vibration, or 105,000 pounds. Next, let us suppose a train moves rapidly on, in which the drivers are out of balance; if the bridge vibrates, the engine and train to abutment will vibrate with it, so that a portion of vibratory mass must be added. Taking the weight of the train at 2,000 pounds per foot, the half-span, or 75 feet, will weigh 150,000 pounds. Finally, let it be supposed that the static deflection of the bridge for this train load is one inch, which is about that found for such cases.

Now, by the principles of dynamics, the time of vibration for this case, supposing the load at the center of bridge is found to be

$$t = \pi \sqrt{\frac{Wd}{wg}}$$

Where  $W$  is the total load,  $105,000 + 150,000 = 255,000$  pounds,  $w$  the added load = 150,000 pounds,  $d$  = the static deflection, = 1 inch, or  $\frac{1}{12}$  foot, and  $g$  = the acceleration of gravity = 32, nearly. Introducing these and reducing, we find the time of a simple vibration to be 0.2 second, a value which agrees with the time of revolution of the drive wheels. Hence, unbalanced drivers will here cause vibration, with a

period of 0.2 second. The period, from the highest point back to that point of movement, will correspond to the entire revolution, or 0.4 second of time. This will cause  $2\frac{1}{2}$  complete movements per second, and is the period which would be noticed by an observer.

Similarly, a bridge of 300 feet span, weighing 2,600 pounds per foot, undergoing a static deflection of 2 inches from a freight train load of 2,000 pounds per foot, will vibrate in a period of .35 second. A double vibration, which corresponds with the time of revolution of a drive wheel, would be made in 0.7 second. This time of revolution of 4 feet drivers answers to a train speed of about  $11\frac{1}{2}$  miles per hour, or  $14\frac{1}{2}$  for 5 feet drivers. This case answers fairly to freight trains.

Hence, it appears that bridges are liable to become badly shaken from cumulative impulses; those of 100 to 200 feet span by passenger trains, and those of 200 to 400 feet span by freight trains.

To estimate the amount or intensity of this action, first consider passenger trains. To this end we will take advantage of the calculations of Mr. J. W. Cloud, of Altoona, Pa., engineer of tests for the Pennsylvania Railroad. The results of his calculations are given in a valuable paper, evidently prepared with much care, on *Shocks on Railway Bridges*, and read before the American Institute of Mining Engineers, February 1881. His calculations are for a locomotive of the Pennsylvania Railway, Class B, the weight of which in running order is 73,100 pounds. Drive wheels, four in all, are 62 inches in diameter, weight of tender, loaded, 49,800 pounds.

The shocks that Mr. Cloud calculates, are those due to the centrifugal force of the counterbalance weights in the drive-wheels, and considered as acting upon the bridge like a hammer with repeated blows, but without supposing synchronous bridge vibration to follow.

These calculations, as far as the downward and upward thrusts from centrifugal force are concerned, are exactly to our purpose. At a speed of 50 miles per hour, these thrusts for each of the four wheels are given at 6,260 pounds, and act downward when the counterweight is down, and upward when the counterweight is up, the two being repeated  $4\frac{1}{2}$  times every second.

For our present purpose we must find the effect of all the wheels on the bridge, supposing the latter to vibrate in synchronism.

Now, as a wheel revolves, the centrifugal force acts in the direction of a radius through the counterweight, but this radius revolves with the wheel. For a half revolution there is a component downward, and for the other half there is a component upward. The resultant effect for a half revolution is about the same as though two-thirds of the force acted constantly for the half revolution downward, and then for a half revolution upward. Hence, for a single wheel, the two-thirds of 6,260 is 4,173 pounds. Now, to include the effect of the 4 wheels, it appears, from the fact that opposite wheels have cranks at right angles, the resultant of forces in a right-angled triangle should be taken for each pair of wheels, giving  $1.42 \times 4,173 \times$  by 2 lbs. = 11,851 lbs. for the combined action of all the wheels, in the form of a constant force for a half revolution. This is equivalent in its effect upon the bridge to that of all the counterweights.

Now it is well known by the principles of dynamics, that the dynamic deflection due to this force is twice the statical. The latter can be found by simple proportion

in a comparison of the 11,851 pounds with the train load of 150,000 pounds. If the latter produces a deflection of 1 inch, the former will cause a statical deflection of .079 inch, which will be downward for the downward force, and *vice versa*. Calling these points of static deflection neutral points, we have for cumulative synchronous vibration the first dynamic downward deflection, equal to  $2 \times .079 = 0.158$  inches, with the lower neutral point at the middle of the amplitude. Now, because the force is reversed, the return amplitude will be such that the upper neutral point divides it equally, from which it appears (by aid of a sketch) that the latter amplitude is three times the first. The next amplitude, downward, with lower neutral point central, will be such as to reach a point in descent which is below the first lowest point of deflection, by a distance which equals four times the statical deflection. Now by the continuation of this action, the force being supposed to reverse with the motion, each succeeding point of descent will be lower by a four fold statical deflection, or by  $4 \times .079 = 0.316$  inches. Similarly for the upward movements.

Now, as the wheel makes about five complete turns along the central part of the bridge, we find this four fold deflection to be repeated five times, giving us a resultant total deflection, due to the cumulative action, of  $5 \times 4 \times .079 = 1.580$  inches; a deflection which is in excess of that due to the whole load of 150,000 pounds, viz.: one inch, by over 50 per cent. Hence, the cumulative action more than doubles the strain on the bridge. From this it appears that an iron bridge, calculated for the usual statical strain of 10,000 pounds per square inch, would, from the additional cause now considered, be strained to 25,800 pounds per square inch, a strain which is fully up to the elastic limit, and hence such a bridge would be in imminent danger of destruction.

The individual impulses will vary as the square of the velocity, or speed of the trains, so that for about  $35\frac{1}{2}$  miles per hour the superadded strains will be only half what they are found for the above case of 50 miles per hour. But one point to be noted is, that during a run of 100 or 200 miles, at a stated speed of 30 miles per hour, an occasional speed of 50 may be reached, and this, likely enough, at the critical moment of crossing a bridge.

For freight trains, at 15 miles per hour, with 4-foot drivers, a single impulse is only about one-seventh that for 50 miles, as above. But as the bridges attacked are twice as long, and the number of impulses twice as great, the resultant effect is about one-third that for the 50 mile speed, and hence causes a 35 per cent. superadded strain.

This action is believed to be a potent cause in the destruction of bridges, because the drive wheel system is never exactly balanced. But such vibration is not expected for every train, nor every bridge. The reason well authenticated instances of its occurrence are not plenty, is probably due to the fact that observing persons are not often in the position to detect it. Can't the survivors of the St. Charles bridge disaster explain?

At least one case occurred in the experience of the writer, causing personal alarm for the second and a half that the engine was apparently jumping along the bridge. It was during a ride in the cab of an engine, while seated and leaning out of the window; the bouncing was decided, and with no mistake, because the ride in this position was taken for the express purpose of seizing upon any peculiar incident or phenomenon. It furnishes a striking corroboration of the above calculations.

## A BRIDGE INDICATOR.

In order to study these actions more satisfactorily, as well as other "dynamic effects" of a moving train upon a bridge, an instrument has been devised which might be called a *bridge indicator*, the object of which is to give a graphic record of the movements of a bridge as a train passes it. A rude affair of the kind has been used with results given in the accompanying diagrams numbered 1 to 7.

In this case a bridge near Columbus, Ohio, was chosen as the subject of experiment with the instrument, it being the only one yet experimented with. This particular bridge was a "pony," or "half Howe" truss, of two spans, both upper and lower chords being continuous over the central pier. Each span is  $60\frac{1}{2}$  feet long, with a total depth of truss of 8 feet 9 inches. The chords are of three timbers, 5, 10, 5 by 12 inches in section for the lower, and 5, 10, 5 by 9 inches for the upper chord. Main braces are 6 by 8 inches, and counters 6 by 6 inches.



The upper diagrams of the cuts, numbered 1, 2, 3, etc., were all taken at the middle of the west span of the bridge. The lower diagrams, of the same numbers,

were taken at the middle of the west half of the west span. Thus, any two diagrams under one number were taken simultaneously, the upper at the middle, and the lower at the quarter of span.

The track on this bridge was straight, except at the west end, where 10 feet belong to a curve of about four degrees. Thus, a tangent point lies in about 10 feet from the west end. The object of placing an indicator at the west quarter of the bridge was to observe the effect of this tangent point.

A description of the instrument will aid us to a better interpretation of the diagrams. At each point for taking diagrams a wooden board, dressed smooth, was secured to the bridge firmly at one truss. The plane of the board was vertical and perpendicular to the line of the truss. A paper was secured to the board by thumb tacks for each diagram. Upon these sheets, while thus tacked to the boards, the diagrams were made. At the midspan the paper faced toward the east, while at the west quarter it faced toward the west. From the ground beneath the bridge a stand was built of timbers, and brought up to where a pencil could be firmly held by it, and in such position as to lightly touch the paper tacked upon the board secured to the bridge, as above described. Under these conditions a movement, due to the yielding of the bridge in any manner, would be indicated by a mark of the pencil upon the paper. A vertical deflection of the bridge would make a vertical mark equal in length to the deflection. Also a horizontal movement would be indicated by a horizontal mark, or, finally, any sort of cross motion of the bridge at the indicator would be evinced by its representative mark. In other words, the bridge autographically registers all of its own transverse movements.

The same figures would be obtained, evidently, if the paper were held upon the stand, and the pencil upon the bridge, except one would be inverted with respect to the other. The most natural arrangement is the latter, and for that reason the diagrams are so posed that a downward motion of the bridge is indicated by a downward stroke of the pencil on the figure.

No. 1 was taken at the middle of the bridge when a slowly moving freight train was passing, drawn by an ordinary sized locomotive. The pencil was held on the paper till about 10 cars had passed going east. The bridge sank gradually from A to C as the engine approached the middle of the span. But as it passed on over, the pencil rose to D, and remained there till about five of the heaviest loaded cars passed. For the lighter cars following, the pencil rose to E, and remained there for the next five cars, and it was then removed.

No. 2 is for a freight train going west at about twenty miles per hour, A is the position of the pencil when the bridge is at rest. As the engine came upon the east span the pencil rose from A to the top of the figure, and then descended again to the bottom as the engine came over to the middle of the west span where the indicator was located. Then the pencil rose to the top of the open part of the figure, when it was removed, the engine having just left the bridge. The lower part of No. 2, taken at the quarter, had the pencil in contact longer than the upper part; the heavy blotch at the top of the lower third occurring while the cars of the train were passing.

No. 3 resulted from the passage of a passenger train of four cars going west. As the train struck the east span the pencil rose from A to B, but descended as the



engine came upon the west span to the lowest point, it then rose to the heavy markings at the middle. Finally the pencil returned to A.

No. 4 is for a passenger train going west. As the engine came upon the east span the pencil left the point of rest A, rose to B, while engine was on east span,



went to lower part of figure as engine came on west span, but finally returned exactly to A as the train left the bridge.

No. 5 is for a passenger train going east, four cars. Pencil went down to lower point as the engine was on the west span, then it rose as the second span was reached, and finally went above A to B as the rear of the train was on the east span. But the pencil finally returned to A as the train left the bridge.

No. 6, passenger train, two cars, going east at about thirty miles per hour. Pencil was removed just as the last car passed it. This explains the absence of the point B. A variety of small movements must have occurred when the pencil was about at the middle of the diagram, thus giving cause for the black blotch.



No. 7 was taken as a pony-engine passed very rapidly going east. The pencil was removed as the engine reached the middle of the span. This explains why B is missing. The lower part of No. 7 is a more simple diagram than any of those taken at the quarter, though the pencil was not removed till the engine passed. This is due to the fact that the engine was alone. This card gives us a complete loop, the pencil returning to A.

The diagrams from the quarter point add but little interest. They resemble the others, both as regards general form, and in having two points, A and B. They are smaller than the others, but not so much so as would be naturally supposed. They do not add much light respecting the influence of the tangent point on the west quarter of the bridge. Also the relation of the movements of the bridge at the two points does not appear to be systematic in detail, though bearing a general resemblance as above stated.

Much interest attaching to these diagrams is obscured in the knotted posts. To remedy this it is proposed to arrange a clock-work to carry the paper forward, at a predetermined speed, while the diagram is making. Then if the number of cars in the train is noted, and if the instant at which each end of the train passes the indicator is marked by a dot on the moving diagram paper, we will, by knowing the speed of the paper, have data for miles per hour of train, and ordinates for every position of train. But on the paper we should have two curves traced, one for the

vertical movements of the bridge, and one for the horizontal. This would give us the means of completely analyzing the obscure parts of the diagrams.

Simple lurches would be indicated by irregular sinuosities without law, while for vibrations they would be systematic.

One drawback to the general applicability of this instrument would be found in the inconvenience in erecting the tower for carrying the pencils. As a substitute for the tower, it is proposed to throw out a stone anchor from the desired point of application to the bridge, the anchor having attached a hempen cord or fine wire, long enough to extend to the point of observation. A pencil is then to be arranged in a slide working freely in vertical guides, to which slide the wire is to be attached. A spring, quite flexible, is then to draw up on the slide, making the wire below tense. Then as the bridge rises or falls the wire causes the slide to remain at a constant height, while the instrument and paper are vibrating with the bridge. It is then only necessary to place the pencil to the paper, and the clock-work in motion, to secure the diagram for the vertical movements.

The lateral movements are not quite so easily provided for, since there is need of an anchorage at one side on a level. It is believed, however, that this can be secured in effect by two anchors and chords, the latter forming a junction at the horizontally opposite point desired. To hold them, a tension strand under spring action, drawing as a resultant force to the two anchor chords, will fix the junction point as desired. In case of such double anchorage to the lateral and vertical, two pencils may be made to write on the one sheet or ribbon, and thus one clock-work answer the purposes fully.

Such an instrument, with conveniences for anchorage, could be applied to a bridge in a few minutes, and inspectors could obtain an autographic record of the degree of agitation of any and all bridges examined.

Such diagrams would evidently throw much light upon the vibratory condition of bridges while trains are passing. Studied in connection with definite knowledge of the sinuosities of track line on bridge, balance of drivers, speed of train, etc., and for a sufficient number of cases to include chance occurrences of cumulative vibration, it is probable that all species of dynamic action could be determined, and whether the aggregate is likely ever to result disastrously.

#### INDICATED DYNAMIC EFFECT.

The diagrams are not sufficient in themselves to serve fully the purpose just indicated above. Their appearance might, however, suggest some amount of vibration or oscillation. Referring to No. 7, first part, remembering that the pencil was removed as soon as the engine reached the midspan, we observe some evidence of lateral vibration as occurring simultaneously with the sinking of the bridge. But as to the vertical movements, we see almost no trace of repetition of any part of the movement as would be likely to occur if the bridge vibrated in going down, except in a slight degree in the loop in the bottom. This loop is about one-eighth of the depth of the diagram. The lower part of No. 7 indicates almost no vertical vibration in any part. Loops at the bottom of Nos. 6, 5, and 4, indicate vertical vibration, also of about 22, 14, and 10 per cent. of the depth of the diagrams respectively. Taking a half of these amplitudes as the increase of deflection due to dynamic effect, and comparing with the diagrams diminished by the same, we obtain the percentage which the

dynamic is of the static effect, as 7, 12, 8, and 6 per cent., respectively, as due to the above measurements. Some of the lower diagrams give evidence of about the same percentages. The mean of these percentages is only about half what is required by some railway companies to be allowed for spans of the same length, viz., sixty feet. As given above, in speaking of usual practice in this matter, it is about 15 per cent. for sixty feet spans. But it is always necessary to provide not for average, but maximum stresses in such cases. Hence, the maximum 12 is close enough upon the 15 of practice. Indeed it is exactly that adopted for this span by the Keystone Bridge Company of Pittsburgh.

Nos. 1 and 2 are both from freight trains, and give evidence of almost no vertical vibration. Also the total deflections, counting from the points of rest A, are less for the freight trains than the passenger trains in Nos. 3 to 6. If, however, we add the above twelve percentage of dynamic effect to the deflection in Nos. 1 and 2, we obtain very nearly the same strains as are actually due to passenger trains; and singularly enough, as obtained in actual practice by computing static effect of freight trains and adding the stated percentage for dynamic effect.

These facts, though corroborative of the real existence of dynamic action or impact, yet, at the same time, testify to a somewhat excessive allowance for it by practical engineers. But before drawing conclusions in this way for guiding us in practice, it is necessary that much more extensive data be procured and worked up.

As regards lateral vibration, the first two numbers on the plate are narrower than the rest, the same being taken from passing freight trains. The others are for passenger trains, except the last one from a rapidly moving pony-engine. Hence, it appears that fast trains cause much the greatest lateral disturbance. The resulting effect upon the lateral bracing is a matter of interest. By measurement of the widths of the diagrams taken at the midspan, it is found that the total lateral movement for passenger trains is 42 per cent. in excess of the like movement for freight trains. May not this call for careful attention to the subject of dynamic effect upon lateral bracing?

#### TESTING AND SELECTING MATERIAL.

In the selection of material for bridges great care is exercised by bridge companies, much greater, indeed, than is usually supposed by the mass of people who ride over their bridges. Some bridge companies make tests of the materials not specified or required by the railway companies ordering. For instance, the Detroit Bridge Company examines all the eyebars for a bridge by piling a quantity of them and passing the pin through the eyes at opposite ends simultaneously. Any bar preventing the passage of the pin is thrown out. Then the bars are individually tested to a tensile strain of 15,000 pounds per square inch, and again the pins must similarly pass. If any eyebar has stretched so as to prevent the passage of the pin, it is rejected. Such a practice would discover hidden flaws, and would pay, if discovering such flaws only at the rate of one in a hundred bridges. A flaw, which would probably have been made known by such a test, was actually discovered by the road-master of the Baltimore & Ohio Railway in one of his iron bridges, and the piece had to be removed. A first-class catastrophe might have here resulted, except for the keen eye of the road-master. There are those who object to straining iron going into a structure, especially beyond the working load. But a test which will

discover the few hidden flaws that would otherwise pass unobserved, will probably more than offset imaginary evils due to strains which, though within safe limits, are somewhat in excess of the adopted working load. Accordingly, this test is believed to be a most excellent one, but of the few bridge companies conferred with, in regard to it by the writer, it has been found in use only in the one instance named.

All companies do more or less testing with testing-machines, including pieces ranging from small "test specimens" to full-sized bridge members. Tests for tensile resistance are by far more plentiful than compressive, but a good number of the latter are on record, including full-sized bridge columns. For examples of column tests, see the table for 33 columns of full size, given in the appendix to this report on Strength of Wrought Iron Bridge Members.

It is a quite common practice, however, to test a piece taken from a large bar rather than the whole bar itself. Large bars are thus found to have a lower tensile strength than smaller rolled bars.

Testing-machine tests for tensions, to meet the present demands of bridge builders and companies, must make known at least three quantities: first, the elastic limit; second, the ultimate strength; and, third, the percentage of total elongation of some specified portion of the original bar, usually 8 inches. In some cases the greatest reduction of section is noted, and by some this item is preferred to the percentage as above.

To demonstrate the fact that elaborate testing of material for bridges is not a myth, some results of testing machine work are given below. They will also serve to indicate that the figures given above for iron under "*strains under maximum load*" are fair.

The first set of results are those obtained in testing for the 30 magnificent new iron bridges erected for the New York, Pennsylvania & Ohio Railroad in 1881. Detailed statements of these bridges are given in my special report of inspection, printed elsewhere in this report. They will serve to indicate the variation of the tensile strength of iron with the size and form of the cross-section of the piece, including round, square, rectangular, angle bar, channel bar, and plate sections.

#### TESTING-MACHINE RESULTS OF IRON USED IN BRIDGES ERECTED IN OHIO IN 1881.

[Testing by W. R. Webster, M.E., Athens, Pa. Bridges built by Kellogg & Maurice, same place.]

##### ROUND BAR IRON.

For bridges Nos. 30, 49½, 56, 61, 63 and 68:

Breaking resistance per square inch.	Elastic limit per square inch.	Total extension, percentage.	Form and size of section.
54,220 pounds.	28,700 pounds.	17 in 40 inches.	1¾ inches round.
57,010 "	28,500 "	15 in 40 "	1¾ "
55,830 "	28,570 "	15 in 40 "	1 inch round.
58,930 "	27,600 "	15 in 40 "	1 "
48,150 "	28,890 "	7 in 50 "	1 "
54,650 "	.....	19 in 40 "	1¾ inches round
54,650 "	28,560 pounds.	17 in 40 "	1¾ "
55,350 "	28,700 "	13 in 40 "	1¾ "
55,350 "	26,650 "	15 in 40 "	1¾ "

SQUARE BAR IRON.

For bridges Nos. 35, 37, 38, 39, 40, 41, 43, 44, 45, 48, 51, 52, 53, 59, 65, 66 and 67:

Breaking resistance per square inch.	Elastic limit per square inch.	Total extension, percentage.	Form and size of section.
52,400 pounds.	28,220 pounds.	15 in 8 inches.	1 $\frac{1}{2}$ inches square.
51,210 "	29,430 "	12 in 8 "	1 $\frac{1}{2}$ "
52,550 "	28,480 "	23 in 8 "	2 $\frac{1}{2}$ "
50,100 "	24,800 "	17 in 8 "	2 $\frac{1}{2}$ "
52,860 "	27,700 "	27 in 8 "	1 $\frac{1}{2}$ "
50,400 "	25,000 "	25 in 8 "	1 $\frac{1}{2}$ "
52,900 "	26,130 "	16 in 45 "	1 $\frac{1}{2}$ "
51,760 "	25,920 "	18 in 45 "	1 $\frac{1}{2}$ "
52,600 "	25,550 "	18 in 50 "	1 $\frac{1}{2}$ "
53,600 "	28,400 "	15 in 50 "	1 $\frac{1}{2}$ "
53,100 "	27,075 "	17 in 40 "	1 $\frac{1}{2}$ "
57,900 "	31,980 "	16 in 40 "	1 $\frac{1}{2}$ "
54,250 "	27,290 "	16 in 40 "	1 inch square.

RECTANGULAR BAR IRON.

For bridges Nos. 1, 37, 38, 39, 41, 45, 48, 52, 58, 59, 65, 66, 67, 69 and 70:

Breaking resistance per square inch.	Elastic limit per square inch.	Total extension, percentage.	Form and size of section.
53,400 pounds.	29,250 pounds.	15 in 8 inches.	1 by 6 $\frac{1}{2}$ inches.
53,530 "	34,100 "	17 in 8 "	1 by 6 $\frac{1}{2}$ "
60,320 "	.....	22 in 8 "	1 $\frac{3}{8}$ by 4 "
59,460 "	30,670 pounds.	21 in 8 "	1 $\frac{3}{8}$ by 4 "
49,000 "	23,520 "	12 in 50 "	1 $\frac{3}{8}$ by 8 $\frac{3}{4}$ "
50,000 "	23,760 "	19 in 8 "	2 by 5 "
51,400 "	24,950 "	20 in 8 "	2 by 5 "
59,900 "	25,740 "	23 in 8 "	1 $\frac{3}{4}$ by 4 "
51,880 "	25,950 "	19 in 8 "	1 by 5 "
49,800 "	26,130 "	13 in 8 "	1 by 5 "
51,280 "	28,300 "	13 in 8 "	1 by 5 "
54,660 "	31,680 "	22 in 8 "	$\frac{5}{8}$ by 2 "
55,780 "	31,640 "	33 in 8 "	$\frac{5}{8}$ by 2 "
49,880 "	26,768 "	17 in 50 "	0.84 by 2.9 "
50,690 "	28,380 "	14 in 8 "	0.96 by 2.9 "
51,800 "	27,160 "	25 in 8 "	2 by 5 "
53,710 "	29,120 "	11 in 8 "	1 $\frac{1}{8}$ by 5 "
52,390 "	28,000 "	10 in 8 "	1 $\frac{1}{8}$ by 5 "
49,210 "	28,770 "	17 in 8 "	1 $\frac{7}{8}$ by 3 "
51,130 "	29,640 "	24 in 8 "	1 $\frac{7}{8}$ by 3 "
49,960 "	26,210 "	14 in 8 "	1 $\frac{1}{8}$ by 4 "
51,810 "	28,170 "	21 in 8 "	1 $\frac{1}{8}$ by 4 "
51,470 "	27,440 "	22 in 8 "	1 by 5 "
53,180 "	26,840 "	23 in 8 "	1 by 5 "
52,640 "	27,950 "	23 in 8 "	$\frac{7}{8}$ by 1 "
49,460 "	26,300 "	17 in 8 "	$\frac{7}{8}$ by 1 "

CUT FROM PLATE IRON.

For bridges Nos. 30, 35, 42, 43, 49 $\frac{1}{2}$ , 63, 69 and 70:

Breaking resistance per square inch.	Elastic limit per square inch.	Total extension, percentage.	Form and size of section.
49,400 pounds.	33,600 pounds.	13 in 8 inches.	$\frac{1}{2}$ inch plate.
48,110 "	27,500 "	11 in 8 "	$\frac{1}{2}$ "
51,870 "	29,520 "	17 in 8 "	$\frac{1}{2}$ "
50,100 "	30,400 "	16 in 8 "	$\frac{1}{2}$ "
51,800 "	32,550 "	10 in 8 "	$\frac{1}{2}$ "
55,698 "	34,870 "	18 in 18 "	7-16 "
52,640 "	33,600 "	11 in 18 "	7-16 "
49,400 "	27,950 "	8.7 in 8 "	$\frac{1}{2}$ "
48,210 "	31,800 "	8.7 in 8 "	$\frac{1}{2}$ "
54,250 "	28,520 "	7.5 in 8 "	$\frac{1}{2}$ "
54,250 "	32,200 "	11.6 in 8 "	$\frac{1}{2}$ "
52,920 "	32,250 "	14 in 8 "	$\frac{1}{2}$ "



## ANGLE BAR IRON.

For bridges Nos. 30, 42, 49½, 56, 61, 63, 68, 69 and 70:

Breaking resistance per square inch.	Elastic limit per square inch.	Total extension, percentage.	Form and size of section.
54,530 pounds.	28,700 pounds.	20 in 18 inches.	3 by 4½ in. angle.
52,420 "	28,180 "	18 in 18 "	3 by 4½ "
54,180 "	30,770 "	18 in 18 "	3½ by 3 "
54,320 "	30,100 "	18 in 18 "	3½ by 3 "
57,140 "	33,040 "	21 in 18 "	3½ by 3½ "
55,010 "	30,680 "	19 in 18 "	3½ by 3½ "
55,240 "	34,930 "	13 in 8 "	.....

## CHANNEL BAR IRON.

For bridges Nos. 56, 61, 68, 69 and 70:

Breaking resistance per square inch.	Elastic limit per square inch.	Total extension, percentage.	Form and size of section.
54,170 pounds.	24,850 pounds.	14 in — inches.	Web of 12 in. channel.
55,410 "	34,670 "	19 "	" 12 "
51,650 "	31,840 "	17 "	" 12 "
52,370 "	28,840 "	7.5 "	" 10 "
56,580 "	30,930 "	14 "	" 10 "
57,650 "	33,540 "	21 "	" 10 "
51,710 "	24,440 "	6.3 in 8 inches.	" — "
57,180 "	31,980 "	17 in 8 "	Flange, — "

The extensions noted in the third columns are the percentages of stretch before parting, while undergoing the experimental test. For instance, "14 in 8 inches" means that a portion of the bar, 8 inches long, within which the fracture occurred, stretched to a length greater by 14 per cent., so that the 8 inches portion would be about 9½ inches long after fracture; as measured by placing the fractured ends in contact. The measurements are made between permanent points noted on the bar before experiment. The longer the portion considered, the less will be the percentage, because most stretch occurs near the point of fracture, due to "necking."

Considering all the figures, the round, square, and rectangular bars are more uniform in results than those of the plate and angular sections, which is expected from the fact that the latter are less refined in manufacture, as has been explained. As to meeting the 5,000 pounds ultimate strength, and 26,000 to 30,000 pounds elastic limit requirements of bridge builders, the iron as a whole, runs well. Also the large bars, which usually have low values of the ultimate strength are seen here to hold up well, even to sizes 2 by 5 inches, or 1½ by 8 inches. The low values are not confined to the large bars. These results indicate that bars up to 2 by 5 inches in section can be used without hesitation in place of a greater number of smaller ones. Usually, however, builders have greater confidence in bars not over 1 or 1½ inches thick. Some go so far as to provide a formula for reducing the estimated strength as the section increases. For instance, the Edge More Iron Company, for bridges, use for wrought iron in tension,

$$\text{Ultimate strength} = 52,000 - \frac{7,000 \times \text{area of section}}{\text{Periphery}} \text{ pounds,}$$

all dimensions in inches.

In these tests for large sections, the full sized bars were not put into the testing machine, but portions of convenient size, such as were cut cold from the larger bars by machinery. But the cutting was carefully done with a view of not straining the iron.

The following results were obtained through the kindness of John L. Gill, jr., of Pittsburgh, Pa., from experimental tests of bridge material manufactured in Pittsburgh.

#### TESTING MACHINE RESULTS OF IRON FOR BRIDGES.

[ Done by J. L. Gill, jr., on a superior testing machine of his design and make.]

##### BAR IRON.

Breaking resistance per square inch.	Elastic limit per square inch.	Total extension. Percentage.	Reduction of section at fracture. Percentage.
51,000 pounds.	27,000 pounds.	25 in 8 inches.	39
51,000 "	27,000 "	24 in 8 "	32
53,000 "	28,000 "	27 in 8 "	41
49,000 "	22,000 "	24 in 8 "	29
49,000 "	22,000 "	24 in 8 "	32
51,400 "	28,000 "	29 in 8 "	42
50,600 "	27,000 "	26 in 8 "	33 upset.
51,400 "	27,600 "	29 in 8 "	41
47,700 "		24 in 8 "	29
49,400 "	24,800 pounds.	25 in 8 "	31
53,100 "	30,300 "	27 in 8 "	41
53,500 "	31,900 "	27 in 8 "	38
49,200 "	24,100 "	24 in 8 "	34
50,800 "	26,600 "	26 in 8 "	38
53,300 "	30,800 "	17 in 8 "	21
44,600 "	25,800 "	12 in 8 "	13 welded.
46,300 "	27,700 "	9 <sup>1</sup> / <sub>8</sub> in 8 "	16 "
52,400 "	25,200 "	24 in 8 "	31
51,500 "	26,400 "	16 in 8 "	24
51,800 "	23,900 "	23 in 8 "	40
50,900 "	29,100 "	18 in 8 "	20
52,000 "	25,200 "	23 in 8 "	31
51,800 "	26,100 "	14 in 8 "	21
49,900 "	25,100 "	17 in 8 "	27
51,900 "	29,600 "	18 in 8 "	29
51,500 "	29,300 "	21 in 8 "	32
53,100 "	29,400 "	15 in 8 "	27
52,100 "	28,500 "	16 in 8 "	27
50,300 "	25,100 "	16 in 8 "	25
49,000 "	23,300 "	11 in 8 "	19
55,600 "	30,900 "	29 in 6 "	41
50,900 "	26,700 "	33 in 6 "	49

##### PLATE IRON.

Breaking resistance per square inch.	Elastic limit per square inch.	Total extension. Percentage.	Reduction of section at fracture. Percentage.
51,331 pounds.	26,000 pounds.	22 in 8 inches.	29
49,000 "	24,000 "	16 in 8 "	23
46,000 "	22,000 "	27 in 8 "	31
48,000 "	23,000 "	27 in 8 "	29
48,000 "	22,000 "	20 in 8 "	24
49,000 "	23,000 "	32 in 8 "	26
44,900 "	32,400 "	3 in 8 "	7.4
49,500 "	31,600 "	5 in 8 "	6.6
50,300 "	29,000 "	18 in 8 "	20
50,600 "	28,000 "	20 in 8 "	19
48,400 "	20,000 "	10 in 8 "	14
48,500 "	25,000 "	9 in 8 "	11
49,400 "	28,000 "	8 <sup>1</sup> / <sub>4</sub> in 8 "	12
44,800 "	24,000 "	5 <sup>3</sup> / <sub>4</sub> in 8 "	11
50,400 "	26,000 "	7 in 8 "	13
47,900 "	30,000 "	4.4 in 8 "	11
47,358 "	27,000 "	10 in 8 "	16

These results run very nearly as do those of the first lot, though from a different source and by different testing engineers. This is satisfactory, as indicating uniformity of materials used in our bridges, even though furnished from different parts of the country and tested by different engineers.

The plate iron of the last lot is less uniform in elongation than the bar iron, and thus agrees with the first lot in testifying to the less reliable character of this variety of iron. A low percentage of elongation is deprecated by engineers, and hence plate-girder bridges, which are now becoming quite common, and which are made entirely of plate and angle iron, should have rather higher factors for safety than Pratt trusses, where the tension members are of more highly refined bar iron.

The percentage of reduction of section noted is obtained by finding the actual section subsequent to and at the point of fracture, subtracting it from the actual section of the piece as measured before testing, and dividing the difference by the unreduced section. It is useful in showing how the piece fails. This, together with the elongation, is needed for completely indicating manner of failure. Thus, a piece failing with a slight percentage of elongation in 8 inches, but with a great reduction of section, must evidently fail as though having a soft place at the point of fracture, and, hence, wanting in homogeneity. But uniformity of structure, whatever the reduction, is manifested by a more general and uniform stretch. To point out the significance of the extension and reduction of section more specifically, suppose ordinary cast iron were under use by tension. It would part at about fifteen or twenty thousand pounds per square inch, and with but the slightest, if any, reduction of section or extension of length of specimen. These both corroborate the known fact of extreme brittleness of cast iron. The same might be said of stone, brick, or cement blocks under tension; the results would confirm their brittleness. But these have low tensile strength, as would be guessed in consequence of brittleness. But take the example of tempered steel: It may have such degree of hardness as to neither elongate or reduce in section at fracture, while its strength may be far above that of wrought iron, or even exceeding the same steel itself in the soft state. This steel is brittle—in other words, not pliable nor ductile, while still possessing a high tensile strength. Hence, brittleness and weakness are not co-partners in terminology.

Iron or steel may be in such condition as to stand a reasonably high resistance to tension, while, at the same time, not ductile. Such material is in great danger of snapping asunder while strained, by receiving a comparatively slight shock, blow, or vibration. For this reason it is rejected for bridges. The most serviceable way of determining this brittleness, or want of ductility, is by reference to the percentage of extension and reduction of section under test. Hence, these quantities are of the utmost importance to the bridge engineer.

The elastic limit is also important, because it has been demonstrated that strains well within this limit will not produce rupture, even with millions of applications of load; while just at the limit, or point of permanent set or bending, a piece will stand but a few thousand or hundred applications of load. The reason why 10,000 pounds per square inch is used in place of 20,000, in calculating iron bridges, is pointed out above under "*Vibrations and Strains.*" Hence, the ultimate strength is of comparatively little worth, and entirely secondary to the other three factors.

Owing to the fact that steel is now receiving attention, with a view to adoption as a bridge material, and to the belief that steel will supersede iron within a decade for this purpose, the following results are esteemed to be of sufficient interest and instruction to be presented here. These are also due to the kindness of Mr. John L. Gill, Jr., from his book of tests of bridge steel manufactured in Pittsburgh.

### TESTING-MACHINE RESULTS OF BRIDGE STEEL.

(By Mr. J. L. Gill, Jr., of Pittsburgh.)

#### BESSEMER STEEL.

Breaking resistance per square inch.	Elastic limit per square inch.	Total extens'n— percentage.	Reduction of section at fracture—per- centage.
96,782	73,551	17	43
98,700	77,700	7.7	22
97,300	74,500	14	35
107,100	79,500	16	42
104,100	80,500	14	45
93,100	73,300	17	26
88,900	67,700	18	43
96,000	74,400	17	42
92,000	69,600	17	53
93,800	73,131	18	41
95,800	69,980	17	38
82,500	61,100	19	40
101,200	72,600	17	30
101,054	71,300	19	42
97,600	71,800	19	35
89,300	64,500	19	28
93,400	66,100	19	43
94,000	66,016	18	33
8,664	58,280	16	40
87,500	57,600	18	46
93,800	69,400	17	29
91,600	58,400	16	32
98,000	63,800	12	29
89,900	53,900	14	25
80,000	.....	18	36
85,000	.....	18	38
87,000	66,000	...	49
80,000	62,000	18	48
85,000	57,100	...	40
88,984	59,200	17	40
76,100	54,600	17	32
83,100	53,600	14	27
90,600	60,740	18	42
90,600	58,930	13	23
82,800	59,540	16	37
80,870	55,350	...	43
93,758	70,000	17	38
82,000	61,000	19	40
102,000	73,000	17	30
101,054	71,900	19	42
97,614	72,600	19	35
89,000	65,000	19	28
93,000	68,000	19	43
94,000	66,000	18	33

## OPEN HEARTH, OR SIEMENS-MARTIN'S STEEL.

Breaking resistance per square inch.	Elastic limit per square inch.	Total extens'n— percentage.	Reduction of section at fracture—per- centage.
51,042	30,892	34	59
89,000	44,000	17	24
83,000	43,000	18	22
104,000	60,000	15	23
107,000	55,000	11	23
85,000	49,000	19	30
86,000	46,800	17	27
96,000	46,400	17	27
97,000	52,700	18	33
90,000	45,500	16	28
92,000	43,800	15	25
86,000	39,800	12	16
81,000	40,100	13	12
88,000	47,000	19	29
99,000	49,000	18	24
94,000	53,000	19	22
79,000	45,000	20	31
76,000	45,000	20	35
69,000	37,400	22	34
85,000	45,000	23	46
82,000	45,000	22	34
89,000	47,000	18	26
85,000	45,000	11	10
80,000	42,000	10	9
70,000	41,000	25	33
68,738	40,000	25	45
93,000	51,000	20	36
83,000	46,000	20	37
92,000	52,000	19	30
91,000	47,000	18	24
92,000	54,000	21	36
79,000	46,000	23	32
92,000	47,000	15	12
92,000	48,000	19	39
89,000	49,000	20	46
76,000	42,000	23	31
95,000	45,000	15	27
90,000	52,000	23	44
88,000	52,000	22	44
87,000	47,000	19	20
89,000	48,000	15	20
87,000	47,000	17	22
82,000	43,000	19	39
79,000	.....	8	8
69,000	40,000	22	37 plate.
72,000	46,000	18	81 "

In comparing the two lots of steel tests, the first is found to run far the most uniform in every particular. Also, respecting two of those qualities which are desirable in bridges, viz., high elastic limit and strength, the former are again ahead, and in a very decided degree. Respecting the pliability as indicated by the extension and reduction of section, it appears to exist in a high degree, and to the entire exclusion of brittleness. In this very important matter of ductility and anti-brittleness, this steel excels the iron, whose results of test are quoted above, both as regards high percentage and uniformity.

The columns of elastic limit and strength, however, fluctuate more among the steel than in the iron tests. But undoubtedly a good and uniform degree of pliability, as the converse of brittleness, will universally be conceded as of supreme importance in bridge material. In the light of such a concession, and of the above results of test, we can do no otherwise than grant that Bessemer steel possesses properties and qualities which are superior to all other materials known for bridges.

One remarkable fact in the above Bessemer steel tests is the exceedingly high value of the elastic limit. The first half of the table gives this limit at about two and a half times the corresponding value for iron, and the last half fully twice. Hence, guided by this limit factor, it appears that Bessemer steel bridges would weigh less than half as much as iron bridges, and cost less, even with Bessemer steel at double the price of iron.

As regards the elastic limit, it is found not to be perfect—that is to say, some permanent elongation is always experienced by good iron before arriving at what is usually adopted for that limit. But practically these elongations are nearly proportional to the increments of load, and extend nearly through the whole range of loading up to the so-called elastic limit. Beyond this limit, however, they rapidly increase. The point where this change takes place is noted as the elastic limit. This limit, thus found, is given a more rational showing from the fact that, if at any point within it, the strain be relieved, and then restored, no further permanent elongation is experienced till after passing the previous condition of strain. At points beyond the elastic limit, however, this is not the case. An extended examination of iron specimens will verify the following facts:

1st. Bars immediately from the rolls, which have not been subjected to jars or other causes of strain, will experience permanent elongation at very slight tension. This is true also of bars direct from the annealing oven, even though they had previously been subjected to violent mechanical action. In these cases there appears to be no limit of perfect elasticity.

2d. A gradually applied and removed tension, within the usually accepted elastic limit, produces a permanent elongation, which will not be increased for like or less tensions as above stated. This is also true of compression.

3d. A specimen which has been strained, as indicated in 2d, will take a permanent set for a slight reversal of the strain.

4th. At the point where the permanent elongations cease to be nearly proportional to the increments of load, or to the elastic elongations, we find the usually accepted elastic limit. Some of these facts can be verified by simply straining a piece of annealed wire by hand.

But the most common tests in use among bridge builders, and which are at once both invaluable, and fortunately of easy application by any blacksmith, consist,

1st, of bending a bar 180 degrees around a cylinder, whose diameter equals the thickness of the bar, and which the bar must stand without fracture to be accepted;

2d, of nicking a bar on one side with a cold chisel, and bending it similarly as in 1st with the nick at the bow of the bent, when it will usually break, showing a fracture which must be fibrous and free from glistening points or faces. Very frequent use is made of these tests in the smiths workshops where waste pieces of bar ends, which have no other value except for scrap, are put to a most valuable service.

#### HEADS OF EYE-BARS.

In the manufacture of one very important part of iron bridges, viz., the eye-bars, a number of methods are in use. One consists of forming the eyes by a separate operation, and then welding them upon the bars. The weld is made close to the head, without upsetting the bar near the welding point. This must certainly reduce



the sectional area of the bar at points so near the weld as to be heated, but not worked, because the heat cannot be taken without corroding the iron, and thus eating away a small portion. But where full-sized bars of this kind have been tested to destruction, it appears that the rupturing point is always at some intermediate part of the bar considerably removed from the head, thus proving the reduction by burning to be unprejudicial. This practical ignoring of the slightly reduced end sections appears to be due to the influence of the enlargement of the head. This conclusion is verified by experiments in tension on extended necks of wrought iron, the fracture always occurring at some intermediate point in the neck.

In other cases eyes are formed on the bars by welding several thicknesses of iron upon the side of the bar, thus giving a sufficient body of metal to form the eye. The reduction of section, above mentioned, by fire corrosion, will take place here also, but actual experiment has shown it to be without objection for reasons above given.

#### BRIDGE SPECIFICATIONS.

To illustrate the system which characterizes some of the best managed railway companies doing business in the State, and the care which they exercise in the construction of bridges on their lines, the following specifications have been procured. The first is the general specifications of all wrought iron bridges on the Lake Shore and Michigan Southern Railway,\* together with the memoranda for the present Ashtabula bridge. The second is composed of extracts from the Pennsylvania Railroad Company's specifications for Little Juniata Bridge No. 12, in Pennsylvania:

1. All designs for bridges for The Lake Shore and Michigan Southern Railway shall be based upon the use of the best quality of materials of the specified kinds, and the highest degree of excellence of workmanship in the manufacture and erection.

2. All bridges shall be proportioned in all their parts to support the following weights:

*First.* The permanent weight of the structure, including the timber flooring and rails.

*Second.* A moving load on each track, consisting of two locomotive engines coupled together, and drawing a train of cars long enough to cover the longest span of bridge, the whole train weighing 2250 lbs. per foot of length, with an additional weight for each engine sufficient to make a load of 90,000 lbs., concentrated upon three pairs of driving wheels spaced seven feet apart between centers of axles, each engine being assumed to occupy fifty feet of the length of the train.

3. For the purpose of computing the strains upon the several members of the main girders or trusses, uniformly distributed moving loads, as named in the following table, shall be used, with an additional panel load of 20,000 lbs. at the head of the advancing load, in determining the effect of partial loads upon the web members. All bridges of less than 10 feet span shall be proportioned to carry a rolling load of 30,000 lbs. concentrated upon one pair of driving wheels. The assumed load

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\* The following letter accompanied these specifications:

THE LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY COMPANY, }  
CHIEF ENGINEER'S DEPARTMENT, CLEVELAND, O., Sept. 27, 1881. }

To S. W. ROBINSON, Esq.,

Civil Engineer, etc., 1205 N. High St., Columbus, O.:

DEAR SIR: Yours of August 3d, addressed to "Engineering Department L. S. & M. S. Ry." has just been called to my attention. I take pleasure in handing you enclosed printed copy of our general specifications for iron bridges, with memoranda in regard to the present bridge over Ashtabula Creek. I have no objection to you using the same in connection with your report as you may desire. I desire to say that I shall, at all times, take pleasure in giving you any data in regard to engineering matters on this line within my power so to do. I will be glad to know that with this enclosed, reaches you, and hope it may not be too late for service.

Yours, truly,

L. H. CLARK, Chief Engineer.

for any span intermediate between those given in the table shall be in arithmetical proportion between the spans next above and below in the table.

By span is meant the distance between the centers of the end bearings.

Span.	Uniform moving load on each track per lineal foot, in pounds.	Span.	Uniform moving load on each track per lineal foot, in pounds.
10 feet.....	6,000	100 feet.....	3,200
20 ".....	5,000	150 ".....	3,000
30 ".....	4,500	200 ".....	2,800
40 ".....	3,900	300 ".....	2,700
50 ".....	3,600	400 ".....	2,600
75 ".....	3,400	500 ".....	2,500

4. The floor systems shall be proportioned to carry a locomotive as before described, having a load of 90,000 lbs., concentrated upon three pairs of driving wheels spaced seven feet apart between centers of axles.

5. In determining the total weight of structures for the purpose of calculating strains, there shall be added to the weight of iron in the same, 400 pounds per lineal foot of single track bridges, and 800 pounds per lineal foot of double track bridges, for weight of the timber flooring and rails.

6. All through bridges to have a clear height of 20 feet between the upper surfaces of the track stringers and the top lateral bracing, and a clear width of 14 feet between the trusses for all single track through bridges and all double track through bridges with three trusses, and 26 feet clear width in all double track through bridges with two trusses. All undergrade or deck bridges of more than 50 ft. span to have trusses placed 10 feet apart between centers, single track bridges having two, and double track bridges three trusses; but in no case shall any bridge, whether through or deck, have a less width than one-fifteenth of the span. Deck bridges of 50 feet span, or less, shall have two girders for each track, spaced six feet apart between centers.

7. All bridges of 50 feet span, or less, to be solid rolled or riveted wrought iron flanged girders with solid plate webs—the depth of the girders to be not less than one-tenth of the span, unless otherwise specially ordered.

8. The floor systems of all bridges of more than 50 feet span to consist of—

*First.* Transverse girders resting upon, or attached centrally and securely to, the chords at each panel division, said girders to be of solid rolled or riveted beams.

*Second.* Four longitudinal lines of iron beams, supported by, and rigidly attached to, the transverse girders, the middle two lines to be 6 feet apart between centers, and to serve as track stringers, and the outer lines, being intended to support the ends of the floor timbers or cross-ties, shall be placed at the outer ends of the transverse girders on deck bridges, and not more than 12 inches inside of the inner lines of the trusses in through bridges. The transverse girders on deck bridges to be 15 feet long on single track bridges, and 25 feet long on double track bridges, projecting over the sides of short spans, in order to give a convenient width of floor, and to be equal in length to the extreme width of deck bridges when such width exceeds 15 feet. The entire floor system to be strong enough to support a locomotive engine, such as has been described, at any place upon the floor, whether on or off the track, with a factor of safety of seven.

9. All through bridges of more than 75 feet span to have trusses high enough to admit of top lateral bracing, and all bridges of 75 feet span, or less, with pony trusses above grade, to have the trusses rigidly braced to each transverse floor beam, so as to be maintained firmly in line and position under all circumstances.

10. The lateral bracing of the floor upon which the moving load is carried must be of sufficient strength to resist a lateral force of 400 pounds per lineal foot of bridge, and the top lateral bracing of

through bridges, and the bottom lateral bracing of deck bridges, must be of sufficient strength to resist a lateral force of 200 pounds per lineal foot of bridge. The maximum strains to be as hereinafter provided for members of the main trusses. The lateral braces must, in all cases, be attached directly to the chords, and not to the floor beams at any distance above or below the chords, but may be attached to the ends of the transverse floor beams in the plane of the chords, provided the said floor beams shall be rigidly attached to the chords. Nor will the lateral braces be allowed to be attached to the masonry at the abutments or piers. In all cases there shall be a transverse strut between the lower chords at the ends of the bridge.

11. The portals of all through bridges and the ends of all deck bridges to be thoroughly sway braced, so as to transmit the strains on the top lateral bracing to the bearings upon the abutments or piers.

12. All bridges to be made entirely of wrought iron, made from the most suitable stock, and rolled twice from the puddle bar. No cast iron will be allowed to be used, except for bed plates under the ends of the bridge, and for subordinate details, such as distance and filling pieces, washers, etc.

13. All rolled bar, angle, channel, and tee iron shall have an ultimate strength of not less than 55,000 lbs. per square inch, and all plate iron an ultimate strength of not less than 45,000 lbs. per square inch, and all shall have an elastic limit not below 26,000 lbs. per square inch, under which load no appreciable permanent elongation or set shall take place.

14. Samples for testing shall be taken from the iron intended for actual use in the bridge work, and shall be turned or planed to a uniform section of not less than 1 square inch for a length of not less than 12 inches, and the elastic limit and breaking strain shall be determined on the minimum section of this turned or planed bar, and the section of the same before reduction by stretching, shall be referred to in determining the strains per square inch. When tested by bending, samples 1 inch thick shall admit of being bent double under the hammer, while cold, without fracture.

15. Under the hereinbefore specified conditions as to permanent and moving loads, no member of the main trusses or girders shall be subjected to a greater tensile strain than 8,500 pounds per square inch, net section, after making full deductions for screw threads and rivet or bolt holes. Compression members, the lengths of which between points of rigid lateral support do not exceed twelve times the least breadth of cross section, may be subjected to strains not exceeding 7,000 pounds per square inch, and those of greater proportional lengths to strains not exceeding one-sixth of their ultimate strength, to be ascertained by Rankine's formula for long struts and pillars; the ultimate crushing strength of wrought iron being assumed at 40,000 pounds per square inch. The maximum strain upon floor beam hangers shall not exceed 4,500 pounds per square inch.

16. Tension members with screw connections may have the screw ends enlarged so that the section at the bottom of the threads shall be 10 per cent. greater than the body of the bar, in which case the full section of the body of the bar will be allowed in estimating the strain per square inch.

17. Eye bars when used for tension members, either in the chords or webs of braced girders, shall be made of flat bars, and the proportions of the heads and pins shall be as described below. The heads to be elliptical in form, with the longer axis in prolongation of the center line of the bar. Calling the width of the body of the bar 1, the diameter of the pin shall be 0.75, the longer axis of the head 2.75, the shorter axis or width through center of the eye 2, and the radius of the curves of the shoulders connecting the head with the body of the bar 2.

Other forms of eyes may be used, provided the proportions thereof, as compared with the body of the bar, are not less than above specified.

18. Especial pains must be taken in boring the pin holes, both in point of accuracy of diameter and distance between them. The difference between the diameters of the pins and the holes must not exceed one thirty-second of an inch, and the eye bars of a set which are to be placed side by side in the structure and attached to the same pin, must be of such exactness of length that when they are laid together in their proper relative positions, all being at the same temperature, the pins to which they are to be attached can be passed through the eyes of all at both ends without forcing or driving. The several members attaching to one pin shall be packed close together so as to bring the least possible amount of bending strain on the pins. The pins to be of the best quality double refined wrought iron, accurately turned, and the heads of the eye bars in no case thinner than the body of the bar.

19. Parties submitting designs or proposals for bridges will be required to describe the method intended to be used in enlarging the ends of the screw rods or eye bars, whether by upsetting or welding, and in proving the quality of their work. Upsetting by pressure will generally be preferred.

20. In estimating the strength of tension members of riveted bridges, only the minimum section of metal measured through, and exclusive of the rivet holes, shall be taken as the available section of that member, but the rivet holes need not be deducted from the full section of members subject to compression only, in estimating the strength thereof.

21. All riveted work shall be machine or snap riveted, with hemispherical shaped heads to the rivets, which shall be formed centrally upon the shanks, and the shoulders brought down evenly and squarely upon the surface of the plate or bar. All rivets that shall be found with the heads cocked, or off the center of shank, or loose, shall be cut out and new ones put in their places.

22. The rivets shall be made of the best double refined iron, warranted to be of an ultimate strength of 60,000 pounds per square inch, and of such ductility that perfect heads can be formed at a dull red heat. Rivets shall be generally 13-16 inch and the holes 7-8 inch diameter, and in no case shall the diameter of the rivet be more than 1-16 inch less than the diameter of the hole. Rivet holes to be pitched not less than  $2\frac{1}{2}$  diameters between centers, and in plate riveting not more than twelve times the thickness of the thinnest outside plate, and in no case more than 9 inches apart, nor shall any rivet hole be made nearer to the edge of the plate or bar than  $1\frac{3}{4}$  times the diameter, nor ever nearer than  $1\frac{1}{4}$  inches from the center of the hole. When two or more thicknesses of plate are riveted together there shall always be a row of rivets not more than 2 inches from either edge, so that the joints between the plates may be made impervious to water.

23. The shearing strain on rivets shall not exceed 6,500 pounds per square inch, and the pressure upon the circumference shall not exceed 9,000 pounds per square inch of area, obtained by multiplying the diameter of the rivet by the thickness of the plate or bar bearing upon it.

24. The transmission of compressive strains longitudinally from one plate or bar to another, will be assumed to be wholly through the medium of rivets, no reliance being placed on abutting surfaces unless machine faced, and therefore a sufficient number of connecting rivets and joint covered plates of proper strength must be provided for the purpose.

25. In plate girder bridges the webs shall be stiffened by bars of angle or tee iron, riveted vertically upon the webs at such frequent intervals as to effectually prevent any danger of buckling the web plates. No plate iron of less than 5-16 inch in thickness shall be used, except for packing or filling pieces. Each pair of plate girders to be connected at the ends by transverse plates not more than six inches narrower than the girder web plates, and stiffened at the top and bottom by angle irons. The shearing strain on the webs of plate girders shall not exceed 5,000 pounds per square inch.

26. Rivet holes may generally be punched, but drilled holes will be preferred, especially for all connecting joints of web members with chords in braced girders. In all cases joint rivet holes must be made with such accuracy that when the parts are laid together as designed to be in the structure, rivets of the required diameter can be passed through all of the holes without reaming or forcing with drift pins. No inaccurate or otherwise defective work will under any circumstances be accepted in the connecting joints of riveted work.

27. All bridges shall rest on cast iron bed plates, of such size that the pressure on the masonry shall not exceed 250 pounds per square inch of bearing surface.

28. Bridges of more than fifty feet span shall have turned wrought iron rollers, running between surfaced cast iron plates, at one end, to allow for expansion and contraction. The weight on these rollers shall not exceed 300 pounds per lineal inch for each inch of diameter of roller. Bridges of fifty feet span, or less, shall have bearings at one end, on friction plates of cast iron, both surfaces in contact being planed.

29. All iron work shall be painted, in the shop, with one good coat of iron ore paint and linseed oil, which shall be applied in riveted work before the parts are riveted together, and all cavities that will be inaccessible after erection shall receive two coats.

30. Bridge builders submitting proposals will be required to furnish detail plans and strain sheets for examination by the Chief Engineer of the Lake Shore & Michigan Southern Railway Company. Those accompanying rejected proposals will be returned, but the accepted plans upon which the work is executed shall be the property of the Railroad Company.

## MEMORANDUM

RELATIVE TO IRON BRIDGE ON LAKE SHORE & MICHIGAN SOUTHERN RAILWAY, OVER ASHTABULA CREEK, AT ASHTABULA, OHIO, BUILT IN 1877.

[Keystone Bridge Company, of Pittsburgh, Pa., Contractors.]

One span of double track deck bridge. Length, center to center of end bearings, 154 feet; height from bridge seat to top of track stringers, 21 feet 11 inches; two trusses 18 feet apart center to center; end posts perpendicular with floor beams to carry ends of track stringers, uniformly distributed; moving load assumed at 3,000 pounds per foot on each track, or 6,000 pounds per lineal foot of bridge. Printed specifications to govern in all other respects.

## EXTRACTS FROM SPECIFICATIONS LITTLE JUNIATA BRIDGE, No. 12.

*Wrought Iron*

All wrought iron must be tough, fibrous, uniform in quality throughout, free from flaws, blisters, and injurious cracks, and must have a workmanlike finish. It must be capable of sustaining an ultimate stress of forty-six thousand (46,000) pounds per square inch on a full section of test piece, with an elastic limit of twenty-three thousand (23,000) pounds per square inch.

All iron to be used in tension or subjected to transverse stress (except web-plates) must have a minimum stretch of fifteen per cent. under ultimate stress, measured on a length of eight inches.

All iron to be used in compression, and for web-plates, of width not exceeding twenty-four inches, must have a minimum stretch of ten per cent. under ultimate stress, measured on a length of eight inches.

All iron to be used in the tensile members of open trusses, laterals, pins, bolts, etc., must be double rolled after and directly from the muck bar (no scrap will be allowed), and must be capable of sustaining an ultimate stress of fifty thousand (50,000) pounds per square inch on a full section of test piece, with an elastic limit of twenty-five thousand (25,000) pounds per square inch, and a minimum stretch of twenty per cent. in length of eight inches, under ultimate stress.

When tested to the breaking, if so required by the engineer, the links and rods must part through the body, and not through the head or pin hole: such tests must be at the expense of the contractor, when the requirements of these specifications are not complied with.

All wrought iron, if cut into testing strips one and a half inches in width, must be capable of resisting without signs of fracture, bending cold by blows of a hammer, until the ends of the strip form a right angle with each other, the inner radius of the curve of bending being not more than twice the thickness of the piece tested. The hammering must be only on the extremities of the specimens, and never where the flexion is taking place. The bending must stop when the first crack appears.

All tension tests are to be made on a standard test piece of one and a half inches in width, and from one quarter to three quarter inches in thickness, planed down on both edges equally so as to reduce the width to one inch for a length of eight inches. Whenever practicable the two flat sides of the piece are to be left as they come from the rolls. In all other cases both sides of the test are to be planed off. In making tests the stresses are to be applied regularly, at the rate of at least one ton per square inch in fifteen seconds of time.

All plates, angles, etc., which are to be bent in the manufacture, must, in addition to the above requirements, be capable of bending sharply to a right angle at a working rest, without showing any signs of fracture.

All rivet iron must be tough and soft, and pieces of the full diameter of the rivet must be capable of bending until the sides are in close contact, without showing fracture.

*Workmanship.*

All workmanship must be first class: all abutting surfaces must be planed or turned, so as to insure even bearing, taking light cuts so as not to injure the end fibres of the piece, and must be protected by white lead and tallow. Pieces where abutting must be brought into close and forcible contact by the use of clamps or other approved means before being riveted together. Rivet holes must be carefully spaced and punched, and must in all cases be reamed to fit where they do not come truly and accurately opposite, without the aid of drift pins. Rivets must completely fill the holes, and have full heads, and be countersunk when so required.

All pin holes in pieces, which are not adjustable for length, must be accurately bored at right angles to the axis, unless otherwise shown on the drawings, and no variation of more than one sixty-fourth of an inch will be allowed in the length between centers of pin holes. Pins must be carefully turned, and no variation of more than one thirty-second of an inch will be allowed between diameter of pin and pin hole. In the case where rough bolts are permitted, a variation of one-sixteenth of an inch will be allowed between diameter of bolt and hole. Thickening washers must be used, wherever required, to make the joints snug and tight

All iron must receive one coat of boiled linseed oil before leaving works. All inaccessible surfaces are to be painted preferably at the bridge site during erection, with one heavy coat red oxide of iron in pure linseed oil. All iron to be scraped clean from scale before painting.

General Conditions.

The whole of the construction to be first class work, and in strict accordance with the drawings and these specifications. In case of sub-contractors, the specifications are fully binding on them in every respect, and free access and information is to be given by them for thorough inspection of material and workmanship, and all required test pieces, etc., are to be provided as may be requested.

In all cases figures are to be taken in preference to any measurements by scale.

No alterations are to be made unless authorized by the engineer of the Pennsylvania Railroad Company.

Quantities.

The approximate gross weights of material required for construction, are as follows:-

Plate iron.....	47,867 pounds.
E ".....	84,698 "
Bar ".....	95,050 "
L ".....	5,761 "
Cast ".....	1,380 "
Rivets, etc.....	11,744 "

STONE ARCHES.

Of stone bridges, there are some fine ones in the State, particularly on the Lake Shore & Michigan Southern Railway, the Baltimore & Ohio, and the Cincinnati, Cleveland, Columbus & Indianapolis. The former has four or five large stone arch bridges, two or three of which are two-span, and they run from 40 to 80 feet diameter. Also one beautiful two-span skew arch of about 20 feet diameter. At Bellaire the Baltimore & Ohio Railway has a remarkably fine stone viaduct, consisting of thirty-seven semicircular arches of 28 feet diameter, supported on piers 6 by 12 feet. The height of the copings above the streets of Bellaire is 32 feet. Twenty of these arches are in a straight line, and seventeen on a four degree curve, all in dressed stone.

STONE QUARRIES.

In the selection of stone from Ohio quarries for important structures, care is needed lest a soft stone be taken which will not stand the weather.

THE ROADWAY.

Ordinary railroad lines consist of four parts, viz., *bed, ballast, ties, and rails*. A cross-section of the most perfect roadway found in Ohio is given in Fig. 2. The

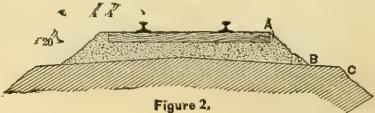


Figure 2.



Pittsburgh, Fort Wayne & Chicago Railway has some seventy miles of it, so fine in its outlines as to be truly a work of art. It is, indeed, unfortunate that all passengers cannot conveniently see it from the moving car. Observed from the rear car of a train, it appears like a beautiful striped ribbon stretching away in the distance. Across the top the stone ballast is just to the upper surface of the ties. At A a definite line of intersection is formed. At B is another, and also at C. The slope AB is as perfect as though the ballast had been piled under a board. The limit of ballast at B is by a single row of ballast stone between egg and nut size, and individually laid by hand. The upper surface of the bed is crowned or convex, as shown in the figure. The part BC is all patted smooth with shovels. A weed is not allowed. The ballast is broken stone where this form of bed is found. The road, however, has not all stone ballast, though the amount is increasing from year to year.

Other roads have considerable portions laid with stone ballast, that ballast being much sought after; cinder or slag from furnaces is also employed, it being preferred to some kinds of stone.

Some Ohio stone is entirely unfit for stone ballast, and does not pay for hauling it from positions of convenient proximity. It pulverizes in use. Limestone is said to be the preferable stone. In considering what material shall be declared the best ballast, it appears that a best ideal ballast must be heavy enough to not be easily disturbed when laid, and to hold the ties in ballast; it should not be too fine nor too coarse, say egg size or less; it should have sharp angular corners to hold the ties, and it should be impervious to water, so as to dry out quickly for preservation of ties. Probably the best possible material for uniting all these conditions is broken glass. It weighs about the same as limestone. Glassy furnace slag comes very near to it. Sandstone is the poorest of all stone, since it wears rapidly, so as not to hold the ties, and it absorbs moisture and holds it to the rapid decay of the ties. But impervious stone allows rain-water to run directly through the ballast to the bed, by trickling down the surface of the fragments and without absorption. On reaching the bed it flows off to the right and left if the bed is sufficiently crowned at its summit. In the best practice it is actually crowned for this purpose.

The minimum depth of ballast shown in Fig. 2 is 6 to 8 inches under the ties. It often actually exceeds this, sometimes to the depth of several feet. Two reasons are given for this—1st, a new bed settles, causing inequalities of grade, and 2nd, inequalities of grade admitted in new roads are, to a considerable extent, equalized according to growing importance of road. In these cases, rather than add new bed material to revive settling annoyance, ballast is piled on.

#### TIES.

Ties used in the State are mostly oak, the best being obtained from Virginia, and known as "Virginia ties." They are of white oak, and run from 10 to 12 inches in width. Chemically treated ties, of elm and some other woods, have been used to some extent. The number per mile varies between 2,500 and 3,000.

#### SLIP SIDES.

In a few instances "slip sides" have been encountered, in which the whole fill, or embankment, for a length of 100 or 200 feet, will gradually be carried latterly out of place. These are found very difficult to manage. In one case, on the Balti-

more & Ohio Railway, a filling of coal slack was used after several additions of earth filling had been carried away. The coal stood very well, its less specific gravity being supposed to be the cause. In some cases piles are driven, the idea being to "pin" the slipping bank to place. But these pins often get badly demoralized from the great pressure. Springs of water are usually found along the upper limits of these slipping sides. By suitable draining the slipping is cured.

#### THE TRACK LINE.

The alignment of the track on curves often gets deranged to a surprising extent, in one case over forty per cent. by measurement was the degree of curvature raised. One instance, on the New York, Pennsylvania & Ohio Railway, was noted where a curve carried the train badly. Several unsuccessful attempts were made to correct it by throwing the track by eye. Finally the curve was re-run with instruments and found badly out. In many cases the track has been observed to be appreciably deranged where measurements were not taken.

Such derangement occurs by the working of section men on the road, as in readjusting grade, or outer rail elevation; in placing new ties, rails, etc. Tangent points undoubtedly "creep" from this cause, the presence of them a few feet in upon bridges, as noticed in a few instances, being apparently due to it.

Track men should have some easy and simple means of ascertaining the deformity of curves and the proper "elevation of the outer rail." For the latter an extraordinary simple and efficient device was found in force on several roads, viz.: a cord or tape line of certain length, say 60 feet, and a rod; the former being stretched as a chord to the curve, the versed sine, measured on the rod, is the elevation of outer rail. Some use 63 feet, and others less for the chord length. For the 63 feet the elevation is right for about a 36-mile speed.

In this device we find the suggestion for a curve corrector, viz.: at all points of an ordinary circle curve the versed sine, for the 63 feet chord, should be of constant value.

The rule for determining the elevation of the outer rail in use on the Pennsylvania Railroad is,—elevation in inches = the square of the miles per hour, multiplied by the degree of curvature, and divided by 1505.

But the rule is varied to suit circumstances. On double track the up-grade curves are made less than the down-grade curves. The elevation is never made more than 8 inches; speeds are reduced in preference. In practice good results have followed elevating the outer, and depressing the inner rail equal amounts, viz.: one-half the above calculation.

For an 8 degree curve, and 8 inches elevation, the speed would be limited to 38.8 miles per hour.

In regard to the tangency of straight and curved portions of track, the usual practice is to make the curves true circle arcs, and exactly tangent to the straight parts. A little consideration, however, will show that instead of this, the path described by the center of gravity of a car should preferably have its corresponding parts thus in true tangency. But this can not be where the outer rail is elevated or inner one depressed, or both, because in tilting the car for this difference of rail elevation the center of gravity is thrown in, and passes around the curve on a circle arc several inches within the circle which is truly tangent to the straight parts of

the path. This has the effect to give a jolt to the car on entering upon a curve. But, in practice, this is compensated in a measure by commencing the elevation of rail on the tangent itself at some distance from the tangent point, and bringing it up to the full value at or near the tangent point.

The object of making a difference of rail elevation on curves is to make the resultant of gravity and of centrifugal force take a position which shall be normal to the floor of the car. To secure this result perfectly, in every respect, it is evident that we can neither begin the elevation on the tangent, nor admit of anything less than full value on the initial part of the circular curve. Neither should there be any offset, sudden or gradual, in the path described by the center of gravity of the car, such as above mentioned as due to rail elevation. Abrupt disturbances in the direction of this resultant would be perceived as jolts toward one side or the other. It is evident that the direction of a disturbance which would be least noticeable to a passenger, or have the least tendency to derail a train, would be vertical, and hence this is the most admissible. But it appears impossible to preserve quietude in every respect in the car, even though the resultant force above named could be maintained truly in the normal position indicated, because the car must be rotated on some longitudinal axis to the extent of the difference of rail elevation. This necessitates an elevation of one side of the car, depression of the other, or a compromise action, the latter being probably preferable. Hence, one rail must be depressed as well as the other elevated, the best condition being obtained when the center of gravity of the car is neither raised nor lowered.

Under these conditions, viz.: first, maintenance of perfectly normal resultant; and, second, a slight rotative movement of the car on its longitudinal axis, we secure the least possible disturbance. Then the only sensation to a passenger, if indeed any be possible in going round a curve at the proper speed, would be that of slight lifting or lowering, as depending on sitting at the lifted or lowered side of the car.

But it is clearly not possible to realize these conditions when a straight track is, according to custom, changed abruptly to a circle. Not even though the circular curve and tangent belong to the center of gravity of the car, instead of the middle line of track. The only way to fulfill the conditions indicated, appears to be to gradually increase the curvature from the tangent to the circle by an intermediate curve of varying curvature. This we will term an *easement curve*; the main circular curve beyond the easement curve being called the *principal curve*. These curves are called curves of "*easing changes of curvature*," and *curves of adjustment*, by Rankine, also "*spiral curves*," by others. See *Rankine's Civ. Eng.*, p. 651; *Railroad Gazette*, Dec. 3, 1880; recent articles in *The Engineering News*, etc. For a more complete discussion and investigation of this subject see *Easement Railway Curves* below.

But all the above refinements respecting the alignment in the horizontal plane will be of but little avail where the importance of the vertical alignment is ignored. From an extended examination of track, both by sightings from the ground, and by taking advantage of opportunities of riding miles within one or two hundred feet of a second track, and, of allowing the two lines of rail to spin through a fixed gaze with a view to observing the relative heights of the two rail lines, it is believed that the error of vertical alignment is usually at least five fold greater than in the horizontal.

Of two sections of road, if one should be found as badly out in the horizontal alignment as the other in the vertical, each otherwise correct, it is altogether probable that the section-boss of the former would get his discharge the first time the road-master came along, while the other would very likely be commended. But in this case the wrong man is discharged, because, as to the riding qualities of the two sections of track, the former would be far the best. This fact is evident by observing that the weight of the car is sure to cause it to follow all inequalities in the vertical alignment, while most of the lateral deviations of the rail will be skipped, and pass without effect. But even if followed to detail, in both instances, the vertical deviations will rock and tilt the car badly, and cause disturbances which will be magnified by the height of passengers or freight above the track. To explain, suppose one rail perfect in line, and the other to rise and fall one inch, in distances of fifty or a hundred feet. Here one wheel has a latitude of vertical movement of one inch. The straight rail forms an axis to this motion, and if a circular cylinder, of radius equal the track gauge, be drawn to this axis, cutting the car lengthwise, every point in that cylinder would have the one inch of motion. That is, a point vertically over the straight rail, at the height of track gauge, would move sidewise one inch when the wheel on the opposite rail rises and falls one inch. Persons in seats directly over the straight rail receive the lateral jolts of about one inch. But persons in the seats at the opposite side of car receive jolts which are both vertical and lateral to the extent of about one inch, which amounts to a diagonal jolt of about one and a half inches. The top of the car may, at the same time, be thrown two or three inches.

This supposes one rail straight, but it is as likely to be cut as the other; both sometimes together and sometimes opposite. In case both rise together one inch, the car receives the vertical displacement bodily of one inch.

But when they are in discord, the passengers are thrown to an extent nearly double that due to the single rail error above. The consequent jolting annoyance cannot safely be prevented by rigid car-couplings, because the strains would be great upon the couplings, and no coupling attempts it.

But now suppose equal inequalities in the lateral direction or in the horizontal alignment. The wheels would skip most of them, the tendency being to go nearly straight ahead rather than turn out for all side-crooks in the rails. This is rendered possible by the clearance between the wheel-flanges and rails. The cars are prevented, to a great extent, from wandering from side to side of the clearance by use of couplings, which offer a considerable resistance to the lateral movement of one car, end crosswise, to the one coupled to it.

From these facts it appears that the vertical alignment is the one which demands the most careful attention for exactitude, while in practice it seems to receive the least.

"Low joints" are found everywhere, though in the most carefully guarded track they are slight. Where the "fish plates" are allowed to get loosened, the wheel pressure and peneing action bend the rails to an arched form. Small "jointies" also favor low joints.

If the rail-joint could be given the same stiffness as the body of the rail, and then if the bearing of the ties upon the ballast could be uniform along the rail line, the rails would remain straight. The "angle-bar" is superior to the fish-plate for

making a stiff joint; but as no joint in use is as strong as the body of the rail, it follows that the deficiency should be made up by a greater amount of tie bearing near the joint. There are many advantages in the so-called "suspension joint." It is formed by placing the abutting ends of the rails over a space of about ten or twelve inches between two ties, so that the fish-plate or angle-bar will span the space, and be secured upon the ties. The advantage of this in the matter of low joints consists in the greater amount of tie bearing upon the ballast at the locality of the joint, and due to the fact these two ties are nearer each other than other ties along the rail. But still the tendency is to low joints, and it seems necessary that, in laying ties, the two widest ones be selected for the pair at the suspension joints. This, together with closely-fitting angle-bars, it is believed will maintain freedom from low joints. This is based upon the supposition that the ties along the middle portion of the rail be all smaller than the joint-ties.

But in actual practice the joints in one line of rails are sometimes placed opposite those in the other line, and sometimes the joints alternate. Some roadmasters strenuously insist on opposite joints, others equally so on alternate, and each will have no other. This is the one thing about railroads on which there is found the greatest prevailing difference of fixed opinion.

Now, respecting the bearing of the joint-ties upon the ballast, 1st, when the joints are opposite, we find that the selected wide ties, which become joint-ties for one rail line, are also in proper position to serve as joint-ties for the other line. This also leaves the middle portions of the rails resting on the smaller ties, a condition pointed out above, as favorable for preventing low joints. But when the joints are alternate, the wide ties selected must be twice as numerous, and consequently differing less from the remaining ones, but besides this we find that the wide ties for the joint at one side extend across, and become wide ties at the middle of the opposite rails. This favors low joints, as pointed out above, and is one reason why alternate joints should be avoided.

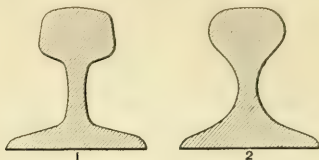
But some contend that alternate joints ride more easily and pleasantly than opposite. This is probably true for equal degrees of low joints, but it seems to be an open question whether the alternate joints, with their greater tendency to low joints, will carry trains more smoothly than will opposite joints well laid on the selected joint-ties. But on some roads very little, if any, attention is paid to selecting joint-ties. In such case it is probable that alternate joints will ride smoothest.

It might be supposed that alternating low joints would give an oscillating motion of car from side to side, and opposite joints a vertical oscillation. The latter is likely to occur for speeds under about twenty-five miles per hour. But in high speeds the time between joints is too small for serving as a period of vibration or oscillation. Hence, it cannot take place. At thirty miles per hour, alternate low joints appear to be entirely without effect for all oscillation, and is not noticed at even twenty or perhaps fifteen miles per hour.

From these facts it appears that low joints can be more effectually avoided when opposite, but will have less prejudicial riding qualities when alternate.

## RAIL SECTIONS AND WEIGHTS.

The form of rail sections is a matter of considerable import. The prevailing modern form is nearly like No. 1, Fig. 2 *a*, while some of the older rails in use in the

Fig. 2 *a*

State are nearly like No. 2. Various devices have been used for making the joint in No. 2, but it is a hard rail to hold. Fish-plates and bolts soon release their grip. The bolts are apt to break, but they first stretch and loosen the plates. Then the plates, rails, and bolts wear badly, because the form of section is seen to not be favorable for holding a fish-plate. As a wheel passes the joint, the receding rail, as the wheel steps off, is depressed below the one in front, so that the latter receives a knock and is battered. In time the end top corners thus become very badly rounded off. Then even freshly tightened joints ever after give a click to the passing wheel. On the other hand, the upper and lower parts appear much as though they would serve admirably as wedges to spread the fish-plates and tear the bolts. In some cases wood is used on one side, and sometimes both wood and iron.

But the nearly square shoulders between the head and foot in No. 1, are seen to be especially well adapted to hold a fish-plate. Even a little looseness under the fish-plate bolts would not admit of very much vertical displacement of one rail on the other at the abutting ends. In this style of section the end corners are preserved admirably.

Rail weights vary on Ohio roads from 50 to 67 pounds per yard, the most common being 60. It is often the case that heavier rails are laid on curves than on tangents. This is to provide against the greater wear on curves.

## LOCK-NUTS.

In spite of the fact of numerous existing lock-nuts of merit, none seem to meet all the requirements for fish-plate bolts. The simplest found in use is the Verona lock-nut. It consists of a split and offset ring of steel, tempered to a spring, and having cutting points at the split. It appears to be made of quarter-inch square steel, cut and bent nearly to a ring, but having an offset of about one-eighth inch, where the ends nearly meet to form the ring shape.

## WEAR OF RAILS.

Practice develops the fact that the outside rail on curves becomes by far the most worn. In some cases the outside worn rails, and inside nearly perfect ones, are interchanged, so that each shall get its portion of wear. The wear now referred to is mostly on the side of the rail head. The tops of the heads also become much worn. Altogether the wear on curves is much in excess of that on tangents, a fact which accounts for laying heavier rails on curves, as practiced on some roads.



The fine theory of the "coning of wheels" is entirely without force in practice. Wheels wear most near the flanges, so that in a short time the effective coning is reversed; that is, the wheels become smaller in diameter of tread at points near the flange than at points remote from it. It seems evident that the more the wheels become thus worn and lose their coning, the greater will be their tendency to climb outward on curves, and consequently the greater will be their slip and the greater the wear, not only of wheels, but also of the rails on curves.

The recent improvement in chilled car-wheels of leaving an inch at the rim-edge of tread, without chill, will doubtless tend to make the wear more uniform over the whole tread.

The effort to successfully avoid the excessive friction on railway curves, due to the common system of two wheels tightly fixed on one axle, has been often repeated since railroading began. All have succeeded in what appears to the inventor to be the chief difficulty, viz., securing independence of wheels. A great variety of independent wheel-devices have been brought out, all of which actually accomplish a great reduction of the frictional resistance to traction on curves. For many of these a very material reduction of resistance has been proved by dynamometric test. By the kindness of Mr. J. S. Paxson, of New York, I have the statement of a reduction of over 36 per cent. for street cars on curves of 40 feet radius, according to careful trials, by Chas. E. Emery, C. E. Also Mr. Paxson furnishes figures to show a saving of 33 per cent. of draft for ordinary railway express cars, as formerly drawn by horses through the streets of Baltimore, over sharp curves from one depot to the other, on the through line from Philadelphia to Washington. But these curves offer unusually high resistance for sharpness of curvature. On ordinary railway curves it must be much less, though still appreciably greatest for the tight wheels.

Diagrams, furnished by Mr. Paxson, of street car wheels when new, and as when worn equal lengths of time, as "independent," and as "rigid," show over twice as much wear for the rigid as for the independent wheels; of course a greater wear of rail accompanies a greater wear of wheel.

There appears to be two leading forms of the independent wheel arrangement. The one which has apparently come nearest to practical success is Harrison's patent, in which the two wheels are on one axle; one being fixed in the usual way, while the other is secured to a sleeve of about half the length of the ordinary axle, into which the end of the axle, opposite the fixed wheel, is placed loosely, or with freedom to turn. In some trials, instead of the sleeve, the hub of the loose wheel casting has been extended to form a bearing for the axle to turn freely in, the other wheel being fixed as above. These plans differ mainly in construction only. The second arrangement provides a short axle for each wheel, so that a 4-wheel truck would have four axles and eight bearing boxes. A truck of this sort, patented by Timms & Eaton, and arranged for adjustment to either broad or narrow gauge, is manufactured at the Capital City Car Works, Columbus, O.

But railroad men seem not to be ready to adopt the independent wheel arrangement on the testimony of a dynamometer, or with proof of reduced wear and reduced coal pile. Suspicions are entertained of a greater liability to derangement, and of greater danger to travel. Conservatism apparently stands in the way of the independent wheel axle.

## BREAKAGE OF RAILS AND AXLES.

Rails, laid with the first plate or angle bar fastenings, require two holes in each end for the bolts of the fastenings. It is stated that the most frequent point of breakage is at the second bolt hole. Also it is stated that breakages are more frequent in winter than in summer. Some attribute this to a supposed or imaginary action of frost on iron, as though iron freezes up and becomes brittle. Reports from some sources indicate that more breakages occur on rails and axles in winter than in summer, while other reports witness to the contrary. Respecting this, a few facts are relevant:

1st. Experiments on iron indicate greater strength at low temperatures for steady strains, while for blows or shocks, a higher temperature is more favorable for diminished breakage.

2d. The condition of the road-bed is quite likely to be decidedly different in winter than in summer, from freezing action, by first, a diminished elasticity of a frozen bed, and second, by the bearing of the track into inequalities of surface line.

All these variations of condition favor more frequent breakage in winter, except the fact that iron is strongest for steady strain at low temperature; as the strain on rails and axles is from actions apparently more of the nature of shocks than of steady strain, it is doubtful whether the facts, respecting strains and temperatures, favor diminished winter breakages.

But the action of frost—not on the rails, but on the road-bed—appears to decidedly favor winter breakages. This is, of course, especially applicable to such road-bed and ballast as becomes solid and firm by freezing, but not so to one that will not freeze. Here the stone ballast is greatly to advantage, as it is open so that water runs through and does not freeze solid. The slight sticking, by frost, of the stone fragments at the points of contact, is easily broken loose, so that such ballast preserves its summer elasticity. The engineer of the Wabash, St. Louis & Pacific R. R. states that, on that road, the breakages are actually less in winter on stone than on sand or gravel ballast.

## SWITCHES AND FROGS.

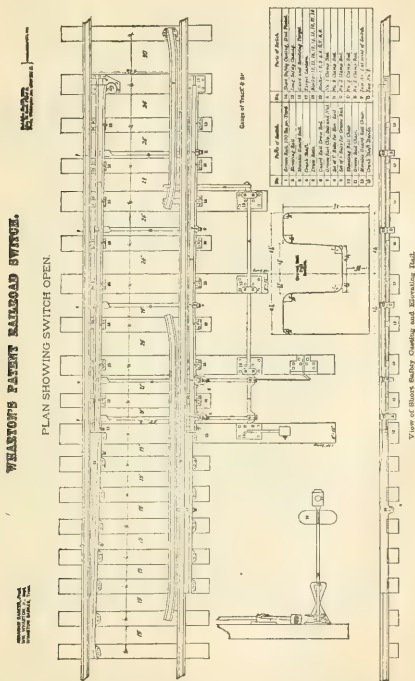
A great variety of notions about switches and frogs are found in vogue. For instance, some have decided preferences for the Lorenz switch, and others for the Wharton, where any other than the ordinary plain switch is desired.

The Wharton switch is the homeliest switch, probably, that was ever made. It would never get adopted from any good looks. But it has great advantages for certain positions in track. A remarkable property of it consists in its leaving the main line of track entirely intact or unbroken. This is secured by means of parts so formed and raised as to lift the wheels high enough to carry the flanges over the rails at the one side. In practice, both sides are raised. This raises the cars also in passing the switch, a requirement which could not be admitted at high speeds of train.

Hence, it appears that this switch is especially adapted to places where trains are to pass at high speed along the main line, but where it is necessary to occasionally turn out to a side track, the latter being always at a reduced speed. Being a "safety" switch, it is well adapted for yards and all places of much switching at slow speeds.

An objection which some road men raise against this, and other truly safety switches, is that the yard men and yard engines will get into the habit of running through it without turning the switch, saying to themselves (*but not to the road officials*), that if the switch is safe to run over when accidentally set wrong, it must also be safe to run over when intentionally wrong. Such a switch would, accordingly, be simply a boon to the lazy switchman. An actual case of such practice would, however, constitute proof positive of the safety quality of the switch.

This switch is shown in the accompanying cut, with name attached.



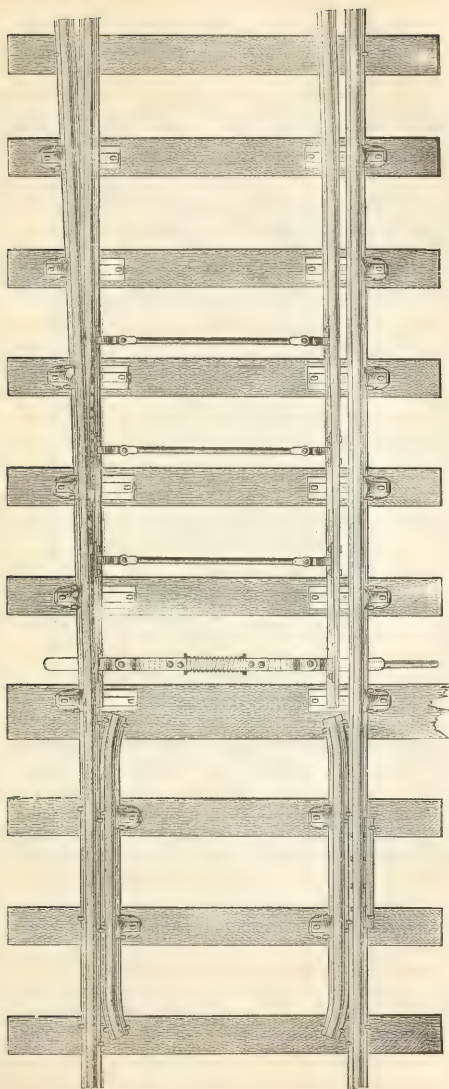
To describe the switch briefly: The two main line rails are seen running parallel over all the ties. Four of the ties are longer than others. On the overreaching ends is planted a shaft, with several cranks for throwing the rails. At the extreme end is an arm and weight. This weighted arm is to be thrown over 180° to reverse the switch, and is provided with a link and pad-lock. On the end of tie, next to lever, is a stand for signal. The switch is shown set for the main line, for which

position only it can be locked, because, if set for the siding, a truck moving upon the switch from the right, on the main line (See cut), would crowd against the switch rails and cause breakage, unless those rails move to allow the wheels to pass. When not locked, this movement is effected by the pressure of the wheel-flange against the guard-rail at the right-hand end of lower rail inside. (See cut.) This guard-rail is seen connected to the extreme right of crank-shaft. When this guard-rail is moved away from the main rail by wheel-flange, the crank is thrown and the switch reversed. Thus the truck passes safely, as it must, because now the switch has automatically become set for the main line. This movable guard-rail is for this purpose.

The switch rails are shown just below the main rails. The upper one is grooved, the outside part being virtually the switch rail for that side, and it is reduced down to a sharp end at the switch point. This is for making the switch rail vanish into the main rail when set to the siding. This rail is usually bent upward, so as to rise into a curve higher than the main rail, and thus raise the wheel in going back from the point. At the opposite side the switch rail is bent laterally, so as to lie close to the main rail for a distance of 2 or 3 feet when set for the siding; and it is also bent upward, and rises above the main rail sufficiently to carry the wheel and flange up over the latter rail, when coming in from, or going out upon the siding.

Now, if a truck comes in from the siding when the switch is set to the main line, it runs off upon peculiar shaped guards or guides, called "safety castings." The one at the upper rail (see cut) is seen to be widest at the switch point. A flange is placed along the lower edge, which catches the flange of the wheel and draws it over to the main line position. The lower safety casting (shorter) is lower than the main rail at the switch point, but rapidly rises to be flush with the top of the main rail. The flange of this wheel is thus lifted, when, by the drawing over of the other safety casting, both wheels are delivered upon the main line in safety.

While the Wharton switch requires one sharpened rail, the Lorenz requires two. These are so fitted that they will lie close up to a whole rail and receive a wheel from it. The Lorenz admits of two unbroken lines of rail, but one of them turns off to the branch track, so that one rail of the main line is cut. In this way it becomes unnecessary to raise the cars in switching. Hence, this switch is adapted to locations where a train may continue on main line or take a branch at speed. This switch is made a safety switch by introducing a so-called "safety spring." But the spring is seriously objected to by some, with the statement that a stick or pebble may become engaged between the pointed and fixed rail when setting the switch, and thus, by the yielding of the spring, the switch lever is turned and locked while the switch is in a dangerous condition of the blocking open of the switch point. In the absence of the spring, the rigidity of the connections would prevent turning the lever while the switch point was blocked open. On this account the name of the spring is changed by some from "safety" to "unsafety" spring. Again, some roadmen claim that the spring works so nicely that enginemen will run through the switch without its being set, thus inducing carelessness on the part of the switchman. The N. Y., P. & O. road sometimes takes off this "safety" spring and puts on another outside near the switch lever, which is so very stiff that a man needs to exert nearly his whole strength to put the lever over to position, when an obstacle is blocking open the point of switch. Thus the switchman becomes aware of the obstruction, and removes it.



THE LORENZ SWITCH.

This Lorenz switch is illustrated in the cut indicated by name. The point of switch is on the fourth tie. At the side of this tie is the first clamp rod, beneath which is seen the safety spring. To this is attached the draw rod for turning the switch. Four clamp rods are shown. These connect the sharpened ends of the switch rails. These points are so sharpened that they lie close to the main rails without the latter being cut, and in some cases so fitted that the sharpened rails rise from the points back for 2 or 3 feet, to a height of about half an inch. This prevents the rim of the wheel from wearing a crease in the main line rails.

Beside the ordinary "frog," two others are found in use, viz.: the spring form and the self-acting frog. Some roads are very partial to one or the other of the two latter, while others will have nothing to do with them. The chief objection seems to be that the movements are apt to become obstructed by sticks, dirt, cinder, snow, or freezing, etc. But on main lines, where turnouts are to be passed at speed, and on lines passing 50 to 100 trains per day, a common frog is apt to become much worn in a comparatively short time. The spring and the self-acting frogs have far greater wearing qualities than the common frog, because they secure nearly the effect of an unbroken rail. Where switching is not frequent, and trains pass at speed, the Wharton switch and spring frog are good accompaniments.

#### BRIDGES ON NEW ROADS.

Economy in the management of railway structures favors the adoption of cheap wooden ones, such as trestles, pile bridges, etc., in the construction of roads, the same to be renewed in due time by more permanent ones. One important consideration in regard to this is the practical "water-way" under bridges. In some cases trestles a few hundred feet in length have been introduced at points of unknown water-way, which have subsequently been reduced to a complete fill, with the exception of a tile opening. In other cases iron structures have been undermined by reason of a cramped water-way. The occasional high water, "highest known for ten years," should be provided for when expensive iron structures are put up.

The life of a wooden bridge is perhaps none too long for enabling the engineer to learn the actual demand upon any bridge location for the waterway. In one instance a fine Pratt Truss of over 100 feet span was placed over a nearly dry channel, at a height above bed of only about five feet. A stranger to the locality would wonder why the space was not filled with dirt, at a cost of almost nothing comparatively. But should he happen to be along at the one or two times a year, when water was up, he would form an opinion sound and correct, as to water-way.

#### CATTLE GUARDS.

This structure, though of seeming insignificance, is yet of very great practical moment. This is due to two facts, viz.: first, the great number of them required on a single road; and, second, that any one defective cattle guard is sufficient to wreck a train.

The amount of attention given to this matter by different roads varies greatly. For instance, they have been found built, except the "strings," of ordinary rail ties, and without much designing either. Some roads have an almost infinite variety, most of them being built of such material, and in such manner as is most convenient



to the locality. Others will not only have a carefully designed and specified "standard cattle guard," for universal use, but will have material lying in their material yards all along the road, cut to specifications and ready for setting new guards, or for repair of old ones on the plan of interchangeable parts.

The latter system reduces the matter of cattle guards to a basis of manufacture with all its advantage of economy, stock on hand, etc.

The three most characteristic standard cattle guards, observed by the writer in the tours of inspection, are here described.

The standard of the Pittsburgh, Fort Wayne & Chicago Railway shown in Fig. 3. A pit is first sunk nearly three feet deep, filled nearly one foot with broken stone. Then two square timbers, about 12 by 12 inches by 12 feet are laid crosswise the track at each side of the pit, and resting on the stone. On these, against the pit's banks, are laid, on edge, planks about 3 by 12 inches by 12 feet. Between these

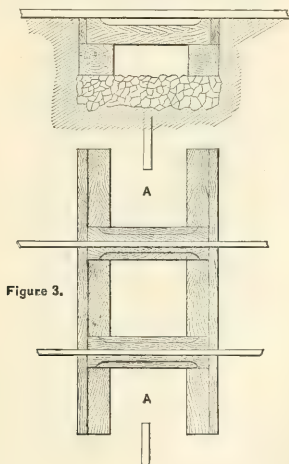


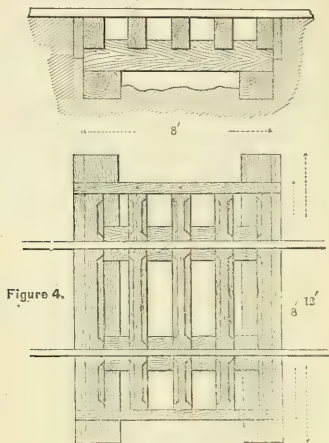
Figure 3.

planks the "strings," about 12 by 12 inches by 6 or 8 feet, are placed, one under each rail as shown. The planks are heavily spiked to the strings, thus fixing the distance between the latter. The rails are spiked directly to these strings, the latter being chamfered. The fence, on either side, terminates about at A, as shown. An effort is always made to drain the pit by a channel, so that water scarcely ever lies about the pit timbers or mud-sills.

In this guard the pit is generally left open, and is about two feet deep. Slats are sometimes put on, though this seems to be the exception.

The standard of the Cleveland, Tuscarawas Valley & Wheeling Railway, is shown in Fig. 4. Two sticks, about 12 by 12 inches by 12 feet, are placed in the bottom of the pit, 8 feet out to out, crossing the rail line. On these are placed two sticks or strings, about 12 by 12 inches by 8 feet, one under each rail. On these last are

placed 5 sawed ties, 6 by 7 inches or 8 by 8 feet, and notched on to a remaining depth of 6 inches. The outer ties are placed flush with the ends of the sticks on which they are notched. Against the outsides of the outer ties, and extending down by, partly over the ends of the strings, are placed planks about 3 by 12 inches by 12 feet and spiked. Across the ends of the ties a binder or guard rail of wood is bolted. The rails are spiked upon these ties as on any other ties. The upper corners of the ties are chamfered.



This is believed to be a most efficient guard. Its cost, as compared with that of Fig. 3, depends mainly on whether the five sawed and chamfered ties, and guard rails and bolts, of Fig. 4, cost more or less than the stone filling in the bottom of Fig. 3. The Wabash, St. Louis & Pacific Railway uses a similar guard.

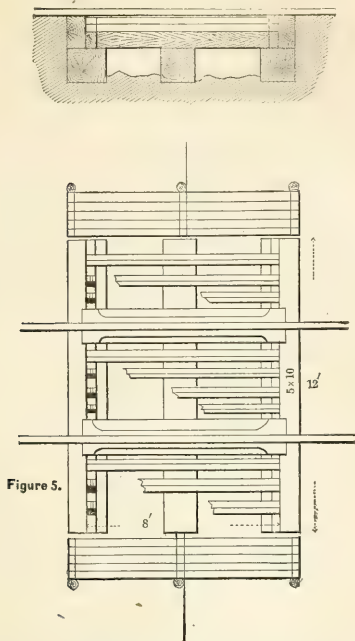
The B. & O. Railway have a more elaborate and costly standard, shown in Fig. 5. In the bottom of a pit three mud-sills are placed, each about 12 by 12 inches by 12 feet. Across and on these are laid the string pieces, one under each rail, and 12 by 12 inches by 8 feet. The ends of these are notched into 5 by 12 inches by 12 feet planks, the outsides of the latter coming just flush with the two outside mud-sills. The strings are chamfered, and the rails are spiked to them.

Slats or bars are counted an essential part of their guard, and they are provided for in a most ingenious manner. On the inside of each of the outer heavy 5 by 12 inches planks is spiked a  $1\frac{1}{2}$  by 8 inches by 12 feet plank, notched at spaces of about 12 inches. The notches are diagonal, so as to carry 4 by 4-inch bars, lying in a diagonal position, that is, so that one corner of each stick is up. These bars are not nailed, because in a few months they sag, and are then turned over. As often as any one sags it is reversed.

At each side of the track, or end of the guard, is placed a half length of fence as shown, from which starts out the division fence to which the cattle guard belongs.

Nothing would seem to be more efficient than this as a cattle guard, and yet the

road-master states that in one case a certain man's cow had educated herself to such a point of excellence that she would deliberately and safely walk the champered



stringers, placing right feet one side, and left feet the other side of the rail. But this isolated instance of successful climbing cannot be considered due to any fault of the cattle guard.

#### GRADE.

The steepest grade noted by the writer is 85 feet to the mile, though that is very likely exceeded in the State. Very little attention appears to have been given to controlling grade; or least possible maximum grade per division, or other portion of road. Neither to the matter of grade compensation for curvature. These questions appear to rise to great importance only on long stretches of road through uninhabited country like our western wastes, where it is not convenient to locate "helper engines" for an occasional excessive grade.

But in Ohio, a road-master will reply, stating the steepest grade, and give its location; and also that it is perhaps ten feet or fifteen feet steeper than any other. He may say, also, that in each case the grade was made as small as possible, regard-

less of reduction of cost of road by allowing the grade to go up to the controlling maximum at any point on a portion to which this controlling maximum belongs.

#### WANTON DESTRUCTION OF RAILROAD PROPERTY.

There is a curious and unexplainable disposition among boys, and extending even to older persons, to regard all property such as bridges, cattle guards, fences, object signals and signs, switch targets, etc., seen along any railroad track, as suitable objects for destructive recreation and sport. Those who have nothing else to do, appear to work at this till wearied; and others, who only have Sundays for it, seem to make full time those days. All jack-knives, revolvers, and shot-guns are kept in service, except for the occasional diversion to throwing of stones, clubs, and the like. The painting and sanding of bridges does not stop the jack-knife. Important members, like braces in Howe truss bridges, have been observed badly cut, and positively weakening those structures. Crossing, stop, and whistle sign-boards are, most of them, peppered with shot and bullet holes, and sometimes split and broken by stone-fisted athletes. Also iron targets of switches. Mile-posts on some roads are made in stone, and on others sheet iron patches are painted and nailed high on telegraph poles for indicating miles, both to avoid destruction.

The most difficult thing of all to preserve is the numbering of structures. When numbers are painted on separate boards, no matter how neatly, and nailed to bridges, culverts, etc., they are made special foci of destructiveness. Even cast iron figures, nailed high on bridges, do not escape.

The most successful way to preserve these numbers is to simply paint them on some heavy stout member of the structure, like the cap of a trestle, and floor beams of bridges.

It seems that such things as railway sign-boards, etc., cannot become to be regarded by boys as property of individuals, whose rights should be respected.

#### EASEMENT RAILWAY CURVES.

The general character of this curve has been pointed out above under "*the track line.*" We will now endeavor to describe it more specifically, and show that the field practice with it is as easy and more valuable than the time-honored, ever-wrong, circular curve.

It might at first be imagined that the complexity of practice with any easement curve must necessarily be so great as to render its use entirely out of the question, but a little consideration of the table of quantities, given below, will show that this is not the case; indeed, from the fact that the quantities needed are already made out and given in tabular form, it may be found easier to construct easement curves than circular curves. Though a great variety of easement curves is possible, only one is necessary, and when this one is selected, all the quantities pertaining to it which are needed in practice, can be at once computed and tabulated, the table being extended to include any case of practice. This is seen to be possible from the fact that any proper easement curve must be a sort of spiral, beginning with an infinite radius at the point of departure from the straight tangent, and extending to where the radius of curvature becomes equal to that of any principal circular curve to be joined with it.

Fig. 6 shows how the easement curve is used, in connection with the tangent.

and circular or principal curve. In the figure A is the point of curve, or where the straight tangent ends and the curve begins. A G is the easement curve, such that the radius of curvature at A is infinite in length, and diminishes as the curve proceeds from A to G, where its radius equals G O, or that of the principal circular curve G J; and finally J B is the easement curve just like A G, in the inverse order of curvature, for getting back upon the second tangent.

This easement curve should not be regarded as a mere fanciful refinement, fit only to be set on a shelf. It is an absolute necessity for perfect track, or for effecting the transfer of a train from a tangent to a circular curve without disturbance of the lateral equilibrium. Such curves are already in use, and being introduced both on new and old roads.

A number of curves have been proposed for effecting this easing, and a few of them have been used in practice. But probably no rules for practice, heretofore published, come nearer to realizing the needs of practice than those presented in a most excellent article in the Railroad Gazette of December 3, 1880, by Ellis Holbrook, C. E., of Richmond, Indiana. A table is there given which contains most of the quantities required. Mr. Holbrook is introducing these curves on the Panhandle Railroad. The methods of that article are found of such rare merit that they are followed largely in this, the chief difference being in additions, which aim to more fully anticipate the needs of practice. A different curve is, however, adopted in the present instance for reasons soon to be given.

The curve of Mr. Holbrook is a spiral, with infinite radius at the tangent point, and with the radius of curvature varying inversely as the distance from the tangent point as measured along the track.

Now the easement curve must, throughout its length, maintain perfect continuity of proper relation of the radius of curvature and rail elevation. That is to say, to meet the above conditions, the radius of the easement curve must change from point to point; and the rail elevation at any one point must be precisely that required for the radius at that point. This relation of elevation and radius is well known, viz.: the elevation is simply in the inverse ratio of the radius. Or, again, the product of the elevation and radius of curvature is a constant for any given number of miles per hour for speed of train. This is true, whatever the form of the easement curve, and hence the latter is neither determined nor influenced by that relation.

Being free to assume the law of the easement curve, it appears that the very best conditions possible to adopt for fixing it are to assume, 1st, that the car, in tilting to the difference of rail elevation as it passes along the easement curve, shall rotate about a longitudinal axis passing through the center of gravity of its cross-section, and, 2d, that it be accelerated in that tilting movement, so that a passenger at the side of the car shall experience only the sensation of a slight change in his own weight while on the easement curve. That change of weight will be an increase if outside and going from the tangent, and *vice versa*. This change of weight, however, should be made imperceptible, and it is believed so to be when the radius of curvature varies inversely as the *square* of the distance from the point of tangency. The object in choosing the square was to reduce disturbances, due to entering upon the curve, to the least possible value.

This makes the law relating to the time and rail elevation identical with that of falling bodies, or with

$$h = \frac{1}{2} f t^2$$

where  $h$  is the elevation,  $f$  the constant at elevation, and  $t$  the time.

By choosing this law of the square, the acceleration of the car in its rotation on a longitudinal axis, as already explained, is made constant, and to a person sitting at the extreme side of a car, the only sensation due to entering upon a curve would be that of a slight increase of weight, or of decrease, as the case might be; and which would continue constant throughout the easement curve. But where the variation of elevation and of consequent rotation of car on a longitudinal axis is as the first power of the distance from the tangent point of the curve, the elevation of a person at the extreme outside of the car would be uniform as the car rotates, but that uniform rate would have a sudden beginning at the initial point of the curve, the action being like that of imparting a uniform motion upward to a body from a state of rest by an instantaneous knock. Though the practical effect of this instantaneous impulse may be declared insignificant, yet from a scientific stand-point, at least, it is incorrect, and the law of constant acceleration more acceptable.

In a particular case of practice, the easement curve is to be continued to where its radius equals that of the *principal*, or main circular curve; when the latter is to be run tangent to it in continuation.

Now, these curves should be understood as forming the proper path for the center of gravity of the car, and not the center line of the track. For greater convenience to passengers, however, it should be the path to the center of gravity of the load of passengers. But as these centers do not differ much in position, they may be assumed coincident.

Assuming this center of gravity to be at a height above the track equal to the gauge of track, viz., 4 feet 8½ inches usually, it appears that in order to make the path of that center of gravity describe the easement and principal curves above laid down, it will be necessary that the curves, when first laid out on the ground, must be moved outward at each point a distance which just equals the difference in rail elevation,  $h$ , at that point. This is to provide against displacing the center of gravity as the car tilts to the difference of rail elevation.

Hence, in practice, run the easement curve, as above, till its curvature equals that of the principal curve. Then set out each point the amount  $h$  proper to it as rail elevation. Then continue on the principal curve. In laying the track, depress the inner rail the same amount that the outer one is elevated, both together being  $h$ . This is to be done for that speed of trains at which it is desirable to have the most perfect freedom from all manner of disturbances.

In compound curves not reversed, the easement curve should be introduced to give a gradual change of curvature, rail elevation, etc., from one curve to the other. In reversed compound curves, the easement curve and elevations should be used to change from the first principal curve to where the track would run off on a straight tangent, and then it is to be run, in the inverse order, to where its curvature equals that of the second principal curve, etc. In short, every portion of principal circular curve should begin and end in an easement curve, as described above.

This gives perfect freedom from side jolts and a probably imperceptible vertical *acc* or decadence. To give an idea of the latter effect, that is to say, of the appare



gain or loss of weight, suppose a man of 200 pounds weight to be at the extreme side of a car, and that the car enters upon the above easement curve at 30 miles per hour. The accelerative lifting or depressing force due to the 200 pounds weight will be, by calculation, only 0.16 of a pound, or about  $2\frac{1}{2}$  ounces, an effect which would influence the cushion of the car-seat less than to place an orange in the rider's lap.

The easement curve thus described is believed to be the most perfect possible form of railway curve. In consideration of the degree of importance attaching to the matter, an extended table has been computed, for use of engineers in the field practical with the easement curve, as above described.

The formulas for calculating quantities given in the table have been published in *Van Nostrand's Engineering Magazine* for July, 1882, page 58. But as it is the table and not the formulas that are needed in the field practice, the latter are omitted here.

TABLE FOR FACILITATING THE FIELD WORK OF EASEMENT CURVES.

$\frac{l}{10}$	R.	Degree for R.	R-R <sub>1</sub>	R <sub>1</sub>	Degree for R <sub>1</sub>	T <sub>1</sub> -T	D <sub>A</sub>	D <sub>r=200</sub>	i <sub>1</sub>	El. ft. 30 M.	El. ft. 45 M.	x <sub>1</sub>	y <sub>1</sub>
1	424100	0° 0'	00	424100	0° 0'50"	6 67	0° 0' 0"	.....	0° 00' 1.6"	.001	.00	.00	10
2	106025		.....	106025	3 20	13.3	.....	.....	13."	.003	.01	.00	20
3	47124		.....	47124	7.25	20.0	.....	.....	44.	.001	.03	.00	30
4	26506	0° 13'	.....	26506	13'16"	26.7	25	.....	1'44	.011	.03	.005	40
5	16964		.....	16964	20 22	33.3	49	.....	3 23	.023	.05	.012	50
6	11781	0 30	.....	11781	29 18	40.0	1'26	.....	5 50	.047	.10	.025	60
7	8656		.01	8656	39 45	46.7	2 18	.....	9 18	.042	.15	.047	70
8	6626	0 52	.03	6626	52 00	53.3	3 26	.....	13 50	.065	.21	.080	80
9	5236		.05	5236	1 05 40	60.0	4 51	.....	19 43	.096	.29	.127	90
10	4241	1 19	.07	4241	1 21 06	66.7	6 44	.....	27 02	.131	.39	.196	100
11	3504		.10	3504	1 38 09	73.3	9 03	.....	35 58	.172	.48	.289	110
12	2945	1 53	.14	2945	1 56 46	80.0	11 41	.....	46 43	.264	.59	.408	120
13	2508		.19	2508	2 17 02	86.7	14 49	.....	59 24	.321	.72	.560	130
14	2164	2 39	.25	2164	2 38 56	93.3	18 23	.....	1° 14 10	.385	.86	.755	140
15	1884		.33	1884	3 02 30	100.0	22 56	.....	1 31 14	.451	1.01	1.000	150
16	1657	3 28	.43	1657	3 27 30	106.7	27 41	.....	1 50 42	.451	1.01	1.288	160
17	1468		.52	1468	3 54 22	113.3	32 58	.....	2 12 54	.451	.86	1.630	170
18	1310	4 22	.68	1309	4 22 30	120.0	39 25	.....	2 37 42	.451	.86	2.064	180
19	1177		.84	1176	4 52 30	126.7	46 18	.....	3 05 22	.451	1.01	2.560	190
20	1061	5 24	1.04	1060	5 24 23	133.3	54 02	.....	3 36 18	.451	.86	3.144	199.9
21	963		1.26	962	5 27 42	140.0	1° 02 34	3° 52'02"	4 10 18	.451	.86	3.820	209.9
22	878	6 32	1.53	876	6 32 30	146.6	1 11 55	4 10 25	4 47 48	.451	.86	3.820	209.9
23	803		1.82	801	7 09 28	153.3	1 22 34	4 29 25	5 28 48	.451	.86	5.500	219.9
24	738	7 46	2.17	736	7 47 28	160.1	1 33 24	4 49 48	6 13 36	.451	.86	6.515	239.8
25	681		2.56	678	8 27 30	166.8	1 45 32	5 11 30	7 02 12	.451	.86	7.670	249.8
26	630	9 06	3.00	627	9 08 50	173.5	1 58 45	5 34 10	7 55 12	.451	1.01	8.974	259.7
27	585		3.48	582	9 51 26	180.2	2 13 07	5 58 05	8 52 12	.451	1.01	10.44	269.7

28	545	10	31	4.02	541	10	36	21	186.9	2	28	12	6	23	05	9	53	30	.523	1.18	12.06	279.6
29	509			4.63	504	11	23	17	193.5	2	44	22	6	50	25	10	59	18	.595	1.34	13.84	289.3
30	476	12	02	5.30	471	12	11	14	200.1	3	02	19	7	19	10	12	09	42	.676	1.52	15.87	299.0
31	447			6.05	441	13	01	00	206.8	3	21	15	7	44	30	13	25	24	.762	1.71	18.09	308.7
32	421	13	40	6.87	414	13	52	30	213.5	3	41	07	8	21	00	14	45	24	.851	1.93	20.51	318.5
33	397			7.75	389	14	46	08	220.2	4	02	30	8	54	00	16	11	12	.952	2.14	23.18	328.1
34	376	15	15	8.71	367	15	40	30	226.9	4	25	20	9	28	00	17	43	00	1.057	2.38	26.11	337.7
35	356			9.87	346	16	37	04	233.6	4	49	10	10	03	30	19	19	00	.851	1.93	29.27	347.1
36	338	17	00	11.00	327	17	35	05	240.4	5	14	23	10	41	22	21	01	00	.952	2.14	32.70	356.5
37	321			12.20	309	18	44	30	247.1	5	40	55	11	20	30	22	49	00	.851	1.93	36.38	365.7
38	308	18	41	13.45	294	19	35	00	253.8	6	08	34	12	00	30	24	43	00	.952	2.14	40.35	374.9
39	294			14.93	279	20	38	51	269.6	6	36	00	12	37	50	26	44	00	1.057	2.38	44.40	383.8
40	282	20	12	16.66	265	21	45	05	287.4	7	04	00	13	16	10	28	49	46	.851	1.93	48.62	392.8

NOTE.—Difference between a 100 feet chord and its arc at 400 feet from A or for the lower line of table is 0.586 feet, and it varies as the square of the degree of curve, and cube of the chord length.  
 The angle to the principal circle curve—I-2*i*.  
 The value of I-2*i*, can never be negative in practice. It equals zero when G and J fall at E in the figure.

Let Fig. 6 represent a simple case where two tangents intersect at C. Take D and H as tangent points, from which a circle curve, shown by dotted lines, might be put in from a center O.

Let A and B be the tangent points for the new curve in which A G and B J are the equal easement curves, and G J the principal, or intermediate circle curve. Perpendiculars at A and B meet in O, at an angle equal the angle of intersection of the tangents. The circle may be extended back from G to F, where its tangent is parallel to A C. O is taken a common center to the dotted circle D H, and the principal circle G J.

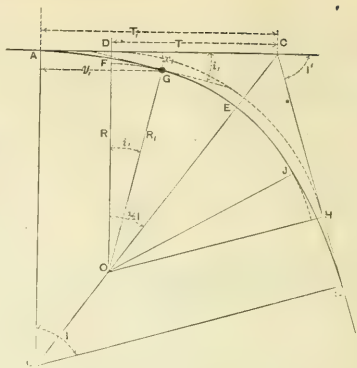


Fig. 6.

In running the curve in the field, we may start at the point A, with chords and tabulated deflection angles run to G; then set the instrument at G, and run the circle G J; then go to B, and run the easement curve B J. To eliminate inaccuracies it may be advisable to run the two easement curves first. Then with the instrument at G examine the total deflection angle for J. If the discrepancy is small, set on J to dispose of it, and connect G and J.

The consideration that the easement curve may be indefinitely extended, leads to the fact that any pair of tangents, meeting with either great or small intersection angle  $I$ , may be connected by a pair of easement curves only. In any such case the easement curves themselves are tangent to each other at a point situated on the line O C, Fig. 6, in the neighborhood of E. In any such case the easement must be run to where  $i_1 = \frac{1}{2} I$ , and the table at once gives all the quantities pertaining to the case by looking horizontally along the line through  $i_1$ , thus found. The point of tangency A, however, is thus fixed at a special position, and this might not carry the curve over the desired route on the ground. This case,  $i_1 = \frac{1}{2} I$ , however, gives the greatest admissible distance of A from C. That this distance be less, there must always be a portion G J of circular curve.

It has been explained that the center of gravity of the car is the point which should describe the curve here laid down, and not the center point between the wheels. This requires that the track at the curve shall be laid outward of the line rim by the instrument and chain, by an amount about equal at any point to the elevation of the outer rail; since the center of gravity of car and load is above the rails a distance about equal to the track gauge.

The table, it is observed, is given for every 10 feet length of track. This is for meeting all needs of practice about interpolating for the exact point G, and for multiplying stakes on the curve to any extent desired. But when stakes are only desired at chords of 50 feet, or 20 feet, of course the intermediate values of table may be passed over.

*Example.*

Given the intersection angle  $I = 60^\circ$ , and the radius,  $R$ , for an ordinary circular curve = 1061 feet.

Then by the usual formula and calculation for circular curves,

$$T = R \tan. \frac{1}{2} I = 1061. \tan. 30^\circ = 612.6 \text{ feet.}$$

Hence, to run in a circular curve, we go 612.6 feet back on the tangent from the intersection point, and start with deflections and chaining, the total deflection having been made out.

But to introduce the easement curves we must go back from the intersection point. the 612.6 feet, plus the tabular distance,  $T_1 - T = 133.3$ , or  $612.6 + 133.3 = 745.9 \text{ feet} = T_1$ , and from this point,  $A$  in the figure, start with the chain and the total deflection angles given in the table according to the chord length. For 10 feet chords, setting stakes 10 feet apart, use all the deflections,  $D_A$ , given in the table. For 20 feet chords use alternate ones. For 50 feet chords use the 49 inches, 6 feet 44 inches, 22 feet 56 inches, and 54 feet 0.2 inch. For any length of chord we must in this case end the easement curve at 200 feet, and hence, the last total deflection on the easement curve will be 54 feet 0.2 inch.

At this point the radius of the easement curve is  $R_1 = 1,060$  feet, and this is the radius of the principal or circular curve extending it. The angle between the tangent, to the easement curve at this point, and the tangent  $T$ , is  $i_1 = 3^\circ 36' 18''$ , as given by the table. Hence, the instrument can readily be set up at the end of the easement curve, and brought to tangency. The circle may then be run, its deflection angle being half the degree of the curve, or  $2^\circ 42' 12''$ , as obtained from the table.

The length of the easement curve,  $l$ , is 200 feet.

The angle of the principal curve will be  $I - 2i_1 = 60^\circ - 7^\circ 12' 36'' = 52^\circ 47' 24''$ . This divided by the degree gives the number of chords of 100 feet, and consequently the length of curve.

If both easement curves have been run before setting the instrument at  $G$ , the work may be checked by sighting on  $J$  with the total deflection for that point.

The elevation of the outer rail for the principal curve is the same throughout as at  $G$ , and = 264 feet for a 30-mile speed. For points along the easement curve the elevation is given in the table.

These values of the elevation are the amounts by which to set the track outward, in order to carry the center of gravity of the car on the curve, as already explained. Hence, the principal curve is to be laid outward about three inches all its length. The easement curve is to be laid outward 0.2 inches at 50 feet, 0.8 inches at 100 feet, 1.8 inches at 150 feet, and 3.1 inches at 200 feet, where the circle curve begins. These are for the 30-mile speed, the offsets being found in the elevation column of the table.

To define the quantities at the heads of the columns of the table, let

$I$  = the intersection angle at  $C_1 = D O H = A O_1 B$ . Then  $D O C = \frac{1}{2} I$ .

$R$  = the radius  $O D$  to the ordinary circle curve dotted in.

$R_1$  = the radius  $O G$ ,  $O E$ ,  $O J$ , to the principal curve.

$R - R_1 = D F$  = the normal distance between the circle curves named.

$T$  = the tangent  $D C$  to the circle to radius  $R$ .

$T_1$  = the tangent  $A C$  to the new curve.

$T_1 - T = A D$  = difference of the two tangents.

$i_1$  = the angle between the tangent line to the easement curve at G and the tangent T.  $i_1 = G O F$ .

$D_A$  = total deflection angles laid off at A, from the tangent A C, for running the easement curve. The greatest one for a particular curve is G A C.

$D_l$  = total deflection angles at some point on the easement curve, from a line parallel to A C, to points beyond.

$D_{l=200}$  = total deflection angles for the instrument at 200 feet from A, as measured along the easement curve.

$l$  = length of the easement curve, counting from A.

$x_1$  and  $y_1$  = co-ordinates to the point G, as shown, but given for every 10 feet of the curve  $l$ .

It may be desirable to calculate certain angles in the field, besides that from the well known relation :

$$T = R \tan. \frac{1}{2} I.$$

Thus, deflection angles at any point on the curve, from a line parallel to the tangent T, are given by

$$\tan. D_l = \frac{x_1 - x_1'}{y_1 - y_1'}$$

which applies for points forward or back of  $x_1', y_1'$ . This deflection angle is useful when it is desirable to move the transit instrument from A to a point on the curve; at a distance  $l$  from A, for passing obstacles. The values of  $x_1$  and  $y_1$  are given in the last columns of the table; also of  $x_1'$  and  $y_1'$ . Thus, suppose the instrument is to

be moved to a point on the curve 300 feet from A, or to where  $\frac{l}{10} = 30$ . Looking along the columns horizontally opposite "30", we find  $x_1 = 15.87$  and  $y_1 = 299.0$ . This being the point to which the instrument is to be moved, these are the values of  $x_1'$  and  $y_1'$ . Now if we seek the deflection angle for the instrument located here, to give the point on curve fifty feet from here, or 350 feet from A, we look where  $\frac{l}{10} = 35$ , opposite which  $x_2 = 29.27$ , and  $y_1 = 347.1$ , whence, for this case

$$\tan. D_l = \frac{29.27 - 15.87}{347.1 - 299.0} = \frac{13.40}{48.1} = .2786,$$

$$\text{or } D_l = 15^\circ 34',$$

the angle which lies between the chord from the points 300 feet 350 feet from A, and the parallel to the tangent A C.

If it be desired to set the instrument at any point on the tangent A C, and to turn off deflection angles to points on the curve, we have

$$D_T = \frac{x_1}{y_1 - y_1'},$$

and the last columns of the table can be used as before. The last two equations are due to Mr. Holbrook, and apply to points either way from the instrument. By aid of these equations it is not necessary to set the instrument at A at all, for it might be set anywhere on the tangent; and, with the deflections found as above, the instrument and chain may be used together to run the curve; and at any time the instrument might be moved over upon the curve.

The advantage of setting at A is, however, considerable, because the table gives at once all total deflection angles under " $D_A$ ."



SPEED AT GRADE CROSSINGS.

The so-called "knownothing stop" appears to be in force everywhere at points where one track crosses another at grade. In some States this is obligatory by State law. But the practice is universal, and appears not to depend at all upon State law.

Very little thought appears to have been given to the subject of economical crossings of railroads. In some instances as much money appears to have been expended in cutting to make a crossing "*at grade*," as would have been required to fill sufficiently to put the crossing "*above grade*." But in many instances thousands of dollars more better have been expended to carry one line over the other, than to have placed them at grade.

Some roads will place their estimates of expenses for all their stoppages at a single crossing point at from 100 to 500 dollars per day. We will probably be entirely safe in basing figures on the lesser amount, as true for a great number of railroads. For 300 days to the year, the \$100 per day will pay interest at 6 per cent. on an expenditure of half a million of dollars. Hence, at such a point as the one now considered, it would be economy to make an expenditure of anything less than \$500,000 to carry one line over the other. This money would cut about a mile of tunnel. A hundred such grade crossings in a State would amount, on account of stoppages, to enough to build, equip, and maintain a first class railroad across the largest State east of the Mississippi.

But more definite figures on this point may be found of interest.

In this report the following figures are to be found, viz.:

Total number of grade crossings, reported by all roads in the State, 252.\*

Total miles of railroad, 5,835½.†

Average number of trains that passed over each mile of railway during the year, 5,680.‡

Gross earnings of all railroads in the State for the year 1881, \$45,822,984.¶

From these figures we find the average distance between two consecutive crossings on any one line of road to be  $\frac{5,835\frac{1}{2}}{252} = 23.1$  miles. Average number of trains over each mile in one day, counting 330 days to the year, Sunday being allowed as about a third of a day in train running, is  $\frac{5,680}{330} = 17.03$ . Gross earnings per day,  $\frac{\$45,822,984}{330} = 138,857$ . Assuming the average speed of all trains at 14.3 miles per hour, the time on the average required for a train to move from one crossing to the next, including all stops, such as for taking and discharging local freights, taking water, stopping at crossings, etc., is  $\frac{23.1}{14.3} = 1.61$  hours, or 96.6 minutes.

Now, allowing 5 minutes as a fair average for the time lost by the average train in making the crossing stop, we find that  $\frac{5}{96.6}$ , or 5.176 per cent. of the running time is consumed in stopping at grade crossings; time which, except for the crossing,

\* Page 17, *ante*.

† Page 7, *ante*.

‡ See page 95, *ante*.

¶ See page 31, *ante*.

would be used in making headway, because steam is up, and all the needed men are at their posts of duty. The 5 minutes are, taken as an average for all trains, freight and passenger, a figure which is placed considerably higher by some good judges. By avoiding this stop, it appears that Ohio roads could increase their daily earnings by over 5 per cent of the actual earnings, or exactly to the amount  $\frac{\$138,857}{1 - .05176} = \$146,426$ ; which shows a gain of  $\$146,426 - \$138,857 = \$7,569$  per day for Ohio roads as the gain in earnings, which, according to the premises, would follow the abolition of the "know-nothing" stop.

To find the cost of a single stop, we have, by multiplying the average number of trains per day by the number of crossings reported  $= 17.03 \times 252 = 4292$ . = the number of daily crossing stops; as these cost \$7,569, it appears that a single stop costs as an average \$1.77.

The total cost of stops for the year 1881 appears from the above figures to be  $330 \times \$7,569 = \$2,497,770$ , or nearly two and a half millions of dollars. This capitalized at 6 per cent., amounts to the enormous and seemingly incredible sum of over 40 millions of dollars.

The actual number of crossings is evidently only half the number reported by all roads, because any one crossing gets reported by both of the roads intersecting. Hence, the number of grade crossing points in Ohio in 1881 is 126.

It appears, therefore, that there might be invested on 6 per cent. borrowed capital, at each crossing point, the sum of  $\$41,629,500 = \$330,393$ , or nearly a third of a million of dollars, as the amount that might be expended at each crossing point for appliances, which would enable trains to pass the crossings at full speed.

The above results are made to depend as much as possible upon statistical figures. It is observable that the only assumptions made are, first, for the average miles per hour, and second, for the average time lost in making the stop. Respecting these there is difference of opinion. The 14.3 average miles per hour appears very low when thinking of passenger trains only. But it is to be observed that it is to include all trains reported, and to be the average speed, not the speed that can be possibly made while under headway simply. Freight trains are delayed much more than passenger trains, and on many roads the greatest allowable freight train speed is 15 miles per hour for ordinary freight trains. Here, 15 being the maximum allowed while running, the average of a trip would fall below. For these reasons the average is taken apparently low.

Again, 5 minutes is considered by some as decidedly too much to allow for time lost in making the stop. But this is intended to cover all time on an average, both, that while standing still and the loss in slowing down and regaining speed. It is supposed that ordinarily more than the *minimum* amount of time is consumed, the minimum being probably considerably less than the 5 minutes.

To estimate the minimum loss of time, we should count the tarry at dead stop only momentary, and the chief portion as due to slowing down and recovering speed. Heavy freight trains on a level, probably, begin the application of breaks about 2,000 feet from the crossing. On some roads, the sign-board giving notice of the crossing is one-half mile, or 2,640 feet, from the crossing, allowing 2,000 feet for slowing down from full speed to full stop; and, assuming that the train in this is steadily or uniformly retarded, the mean velocity for this 2,000 feet would be half that of regu-

lar speed, and hence, the time to run that distance would be just double the time to run the same distance at full speed. The time *lost* in that part of the stop would then be the same as to run the 2,000 feet at full speed. Treating the regaining of speed in the same way, and allowing 2,000 feet for it, the time lost in slowing down and speeding up again is found to be equal to the time required to run 4,000 feet at full speed, or 3.2 minutes at the 14.3 mile speed. If we add 0.8 minute for clearing breaks, etc., when stopped, the whole time is 4 minutes.

But it is held by some that 3 minutes is all that should be allowed for a freight, and  $1\frac{1}{2}$  for a passenger train; also, that the speed ought to be taken at 30 miles per hour for passenger, and 15 to 18 miles for freight trains. It may be of interest to examine the figures from these premises. To do so, it will be necessary to separate the total earnings into parts due to freight and to passenger traffic. By the reports of railway companies to the Commissioner of Railroads these are found to be 70 and 30 per cent., respectively, or \$32,076,089.25 and \$13,746,895.39.

Now, for the passenger train, since it takes 2 minutes to run a mile, the stop sets the train back  $\frac{1.5}{2} = .75$  miles. Hence, the cost of all the stops for the year will, for the average passenger train now considered, be three-fourths the amount earned by one mile of road. Dividing the total earnings by the total miles of railroad, we obtain  $\frac{\$13,746,895}{5,835} = \$2,356$  for the passenger train earnings of the average mile of railway in the State. Hence,  $\frac{3}{4}$  of  $\$2,356 = \$1,767$  = the cost of the passenger train stops at the one average crossing for the year for one road. But, as two roads are concerned at a crossing, this figure must be doubled. That expenditure is 6 per cent. interest on about \$58,900, the amount that could be invested at the per cent stated to avoid the passenger train stops.

Treating the freight train in the same way, we find the time per mile at 18 miles per hour to be  $3\frac{1}{3}$  minutes. Hence, the train, allowing 3 minutes loss at the stop, is set back  $3-3\frac{1}{3}$  miles, or about 0.9 mile on account of the crossing stop. Dividing the freight earnings by the total number of miles in the State, we obtain \$5,428 as the annual freight train earnings of the average mile. Hence, 0.9 of this, or \$4,885 is the annual cost of stopping all freight trains at a single crossing. Doubling this, because two roads have stops at the same one crossing, and putting into capital at six per cent., gives \$162,840, which might be invested at the crossing to avoid the stops of freight trains.

Now, adding the parts for passenger and freight, we obtain a total of \$58,900 and \$162,840 = \$221,740 as the amount of capital that could be invested, at six per cent., at the average railway grade-crossing in Ohio, for appliances or means by which to avoid the stop.

This figure is about a third less than the one previously given from other data. But it is obtained in a more direct and convincing course, because there are but two steps in the reasoning, viz.: 1st, the running distance that the stop costs, and, 2d, the earnings per mile per year. When examined closely, it will be seen to be the minimum figure allowable as an estimate.

Mr. Curtis, the Master Mechanic of the Panhandle R. R. shops, at Columbus, and Mr. Wohl, his assistant, after giving thought to the question, and consulting

with some ten or twelve other officials of that road, state that a freight train *can* make the stop in 5 minutes, but that the actual time, founded on experience and observation over that road, is 7 minutes, and for a passenger train about  $2\frac{1}{2}$ .

For speed of trains, the actual time-tables of the Panhandle, the Baltimore & Ohio, and the Cleveland & Pittsburgh Railways, have been consulted. All the passenger trains found on their schedules give 29.10, 26.25 and 25.25 miles per hour, respectively, for stretches of over 100 miles each, no allowance being made for stops, that is, dividing the total miles by the total time in running those miles. The average of all is 26.71 miles per hour. Sixteen trains are brought into this average, and it is believed that it will be found a good average speed for passenger trains in this State.

The schedule of the B. & O. R'y makes the average through time, for 4 freight trains on one stretch of 143 miles, 13.90 miles per hour. For another stretch of 128 miles, it is 12.40 for 4 trains. For a 100 mile stretch, on the Cleveland & Pittsburgh R. R., it is 10.66 for an average through time of 6 trains. These figures are about the same as it is stated to be for the Panhandle R. R. The average of all these is 12.32 miles per hour; a figure which for through freight trains is also believed to be a fair average for Ohio.

A little reflection will suffice to show that the average through speed per hour is that which should be taken for this purpose, and not the fastest time made from station to station, because it is this through time which is finally influenced by the crossing stop or stops, and also because it is this through time that is concerned in the annual earnings, both for the whole State and for each mile.

Now, to base a third calculation upon these well authenticated data, we may proceed as follows:

1. For passenger trains we have, for average miles per hour, 26.71, or time for running one mile,  $2\frac{1}{4}$  minutes. Loss of time by the stop,  $2\frac{1}{2}$  minutes. Loss in miles run, due to the stop,  $\frac{2\frac{1}{2}}{2\frac{1}{4}} = 1.1111$ . This loss is experienced by each average train at each stop made, and hence continues through the year. Its effect upon a line of railway is, therefore, equivalent to neutralizing the earnings of 1.1111 miles of road, because, without this stop, this additional run and earnings could be made. The annual earnings of passenger trains in Ohio amount to \$13,746,895. The total number of miles of railway being 5,835, the earnings of one mile per year are \$2,356, and of 1.1111 miles, \$2,608. This, then, is the annual cost to the average Ohio railway of the stops made by passenger trains at the average crossing. But, as two lines of railway are concerned at any one crossing, it is necessary to double this figure to cover the entire cost to the two intersecting lines, thus giving \$5,216 as the sum which the average crossing costs these two lines annually, or as the sum which could be turned into earnings if the crossing stop could be avoided.

This, as interest at 6 per cent., represents a capital of \$86,860, and is the amount that could be invested at 6 per cent. for procuring means for avoiding the stops of passenger trains at any one average crossing, where stops must be made at full speed, and only for the purpose of the crossing.

2. Treating the freight trains in the same way, we find the time required to run one mile to be 4.87 minutes, so that the distance that could be run during the 7 minutes lost by the stop would be 1.44 miles.

The earnings of the average mile by freight trains are, as already given above,  $\frac{\$32,076,089}{5,835} = \$5,428$ , and, of 1.44 miles, \$7,806. This is equivalent to the earnings neutralized by one road, and, consequently, \$15,612 of the two roads intersecting at the average crossing, per year. This is 6 per cent. interest on \$260,200, the borrowed capital which might be invested at the crossing for avoiding the stops of freight trains.

For both passenger and freight, the capital which might be invested at 6 per cent. is, therefore,  $\$86,860 + \$260,200 = \$347,060$  for securing such appliances as will enable trains to pass the crossing at speed.

This figure very nearly agrees with the result of the first calculation, and confirms the stated conviction that the second calculation must be regarded as the minimum estimate.

The cost of a single stop for the last two calculations may be obtained by dividing the annual cost of the stops, for one road at one crossing, by the days 330 to the year, and by the trains over each mile, 17.03. Hence, for the second calculation, the single stop costs \$1.18 each, and for the third calculation, \$1.85.

In conversation with Mr. Charles Latimer, Chief Engineer of the New York, Pennsylvania & Ohio Railroad, it was learned that he had served as expert in an important case of crossings, in which results were given as obtained from premises entirely different from the above. By special request for a copy of such calculation, Mr. Latimer has been so kind as to furnish the following, printed from his own manuscript.

The calculation is seen to be founded upon the theory of dynamics; a principle so radically different from any employed above, that the results will be compared with interest.

#### LETTER OF ENGINEER LATIMER.

CLEVELAND, O., August 21, 1882.

S. W. ROBINSON, C. E., *Prof. of Mechanical Engineering,*  
*Ohio State University, Columbus, O.:*

DEAR SIR: I have calculated the cost of stopping a freight or passenger train by the following method:

Taking first the passenger train, assume it to consist of—

8 passenger coaches, @ 44,000 lbs.....	352,000 lbs.
2 sleeping " @ 60,000 lbs.....	120,000 lbs.
1 locomotive and tender, @ 140,000 lbs.....	140,000 lbs.
	<hr/>
	612,000 lbs = 306 tons.

The train moving at the rate of 50 miles per hour, or  $73\frac{1}{3}$  feet per second, will have an amount of *vis viva* =

$$\text{weight} \times \frac{\text{velocity}^2}{2g} = 612,000 \times \frac{73\frac{1}{3}^2}{64.4} = 51,105,590.$$

Ordinary train resistance amounts to 10 lbs. per ton; hence, the resistance of the above train would be

$$306 \times 10 = 3,060 \text{ lbs.}$$

and, dividing the amount of *vis viva* by the train resistance, we find the distance over which the resistance must act, before it brings the train to a stop. This distance will be

$$\frac{51,105,590}{3,060} = 16,700 \text{ feet.}$$

Therefore, by applying the brakes, a momentum which is sufficient to carry the train against ordinary resistance, over a distance of 16,700 feet, is lost.

Suppose there are 10 passenger trains daily then during a year, a single stopping place will cause the loss of

$$\frac{16,700 \times 10 \times 360}{5,280} = 11,387 \text{ train miles.}$$

The cost of a train mile being 75 cents, 11,387 train miles would cause an annual expenditure of

$$11,387 \times 0.75 = \$8,540.$$

Next, assume a freight train to consist of—

50 freight cars, @ 40,000 lbs.....	2,000,000 lbs.
1 locomotive, @ 140,000 lbs.....	140,000 lbs.
	<u>2,140,000 lbs. = 1070 tons.</u>

The train moves at the rate of 25 miles per hour, or  $36\frac{2}{3}$  feet per second; hence, the *vis viva* will be

$$2,140,000 \times \frac{36\frac{2}{3}^2}{64.4} = 44,675,638.$$

The resistance will be

$$1,070 \times 10 = 10,700 \text{ lbs.};$$

and the distance over which the train will move by virtue of its momentum is

$$\frac{44,675,638}{10,700} = 4,075 \text{ feet.}$$

Assuming 25 freight trains pass, per diem, the number of train miles consumed in stops is

$$\frac{4,075 \times 25 \times 360}{5,280} = 6,945 \text{ train miles};$$

and the annual expenditure per stopping place will be  $0.75 \times 6,945 = \$5,210$ .

For more particular accuracy, the distance run from time of applying brakes until the train stops should be deducted from the distances above calculated.

In order to arrive at a moderate conclusion which is susceptible of proof in a different way, we will take a mean between the two values above, which would be \$6,875.

This result is not far from that obtained by calculating each stop as causing a loss of 5 minutes, and calculating the hours, and ascertaining the value of an hour, or of allowing that the train would have run one mile whilst stopping and starting and gaining momentum.

This gives, according to former calculations, about \$6,500.

Very respectfully.

CHARLES LATIMER,  
Chief Engineer N. Y. P. & O. R. R.

Mr. Latimer's data and results may be arranged thus:

	Cars.	Trains daily.	Annual cost.
For passenger trains.....	10	10	\$8,540
For freight trains.....	50	25	5,210
Averages.....	30	17.5	\$6,875

From these figures it appears that for 30 cars to the train,  $17\frac{1}{2}$  trains per day, the total annual cost of the stops at a crossing for one of the roads intersecting, is \$68.75. Again, Mr. Latimer has used 75 cents as the cost of the "train mile," while in the preceding calculations I used the *earnings* per train mile. A little reflection will



show that for the present purpose the latter is correct, since, whether the train stops from one to five minutes or goes ahead, the same cost is entailed. Indeed, to consume five minutes in stopping and regaining speed, there is probably even greater expenditure for steam, wear and tear, than in going ahead. As men and cars are on duty the same whether going ahead or not, it appears that the cost of the run that would be made in the absence of the stop is fully experienced, even exceeded, so that the difference in count, to the railroad company, is a shortage in about a mile of earnings for which the cost is actually paid.

Hence, the avoidance of the stops for a year may safely and fairly be regarded as resulting in a gain in earnings for a given cost; or, in other words, that the cost of the stops is in the form of earnings rather than in the form of actual expenditure.

Hence, instead of 75 cents, Mr. Latimer should have used in his calculation the earnings of the train mile.

To reduce Mr. Latimer's results to the earnings basis, and to the Ohio average figures, it will be necessary to use \$1.681 (see page 95, this report), the earnings per train mile in place of 75 cents. The annual cost above mentioned, viz.: \$6,875, is modified for this by multiplying by  $\frac{1.681}{.75} = 2.2412$ , giving \$15,408.

Again, in place of Mr. Latimer's data, the Ohio averages give:

Average trains—cars, 14.8; trains daily, 17.03,

from which it appears that only about half the number of cars are run on the average Ohio road that were contemplated in Mr. Latimer's calculation, or more

exactly,  $\frac{14.8 \times 17.03}{30 \times 17.5} = .481$ .

This figure should therefore be used as a multiplier to the \$15,408, to reduce it to the same data as regards cars, trains, earnings, etc., as was used in my previous calculations. This gives  $\$15,408 \times .481 = \$7,411$ , as the result according to Mr. Latimer's dynamic method for the annual cost of stops to one of the intersecting roads at the average Ohio crossing, a figure which may be directly compared with the results previously obtained, for the like quantity.

By this calculation the cost of appliances for enabling both the intersecting roads to pass the crossing at speed, is found to be \$247,033; obtained by doubling the figure \$7,411, and capitalizing at 6 per cent.

The cost of a single stop by Mr. Latimer's figures of \$6,875, for annual cost, 360 days per year, and 17.5 trains daily, is \$1.09. According to Ohio averages, it is \$1.32, the trains being taken at 17.03 and the year at 330 days.

The results of the above four calculations may be presented in tabular view for more convenient reference and comparison, thus:

TABLE FOR AN AVERAGE CROSSING IN OHIO, 1881.

No. of calculation.	Train.	Cost of the stops for one year, one road.	Cost of a single stop.	Capital to invest at 6 per cent. to avoid stops.	Total capital.
1 {	Passenger .....	\$9,947	\$1 77	\$380,393	\$330,393
	Freight .....				
2 {	Minimum { Passenger .....	1,767	1 18	58,900	221,740
	Freight .....	4,885		162,840	
3 {	Passenger .....	2,608	1 85	86,860	347,060
	Freight .....	7,806		260,200	
4 {	Latimer's dynamic method.	7,411	1 09 or 1 32	247,033	247,033
	Freight and passenger.....				

In some States the law compelling the know-nothing\* stop has been repealed. This is true of Massachusetts and Ohio, though in the latter State, instead of a straight repeal, it provides an option, viz.: that railroad companies may, in preference to the stop, adopt and use such means for crossing at speed as shall be approved for that purpose by the Commissioner of Railroads. The repeal, however, only followed decisive proofs that better systems for making the crossing existed.

Switch and signal appliances have been so perfected of late as to place at the disposal of railway companies means for passing grade crossings at full speed, in a manner conceded by those who are familiar with it, to be decidedly safer than by the old compulsory "stop."

To realize this fact of enhanced safety, it should, perhaps, first be noted that the compulsory stop is not absolutely safe. For instance, a freight train on a down grade approach might become unmanageable, and break into a train making the crossing. A rear locomotive on a long freight train, especially when around a curve out of sight of crossing and flagman, might, under certain circumstances, remain under steam without knowledge of error, and push the forward end into a crossing train. Though such instances are rare, yet they are known to have occurred.

Suppose each branch of track at a crossing to be provided with a derailing switch, so that in each instance, just named above, the train in error would have been derailed or turned into a side-track. This would have avoided the crash in the two instances mentioned, but the four switches, while avoiding two accidents, might occasion ten for the extra attention they require, unless accompanied by operating mechanism far superior in control to that which has been employed in past years, but the modern, greatly improved, and wonderfully perfect *interlocking* switch and signal apparatus is fully competent to the task.

Indeed, the modern "block system," in making a single block each way at the crossing, would, in all probability, be as safe for passing at speed when clear as would be the old-fashioned stop. But the addition of the derailing or side-track switch on each branch of track, and so worked by interlock with the signals of the block that only one track can possibly be set clear at a time, seems to leave nothing to be desired for absolute safety, at least for a far greater measure of safety than is possible with the old know-nothing stop.

\* Called the "know-nothing" stop from the fact of the passage of the law compelling it in Massachusetts the year of the political "know-nothings."

Apparatus working with the degree of precision and certainty just indicated is already in use on some important lines of railway for operating trains, a notable instance being found in the blocks by which the Pennsylvania Railroad enters the city from West Philadelphia to its magnificent new depot at Broad and Market streets. Here all the switches for handling the two hundred and fifty trains per day which are brought in and out of that depot, and the signals for governing the movements of those trains, are interlocked with each other. In one tower is a machine with 56 levers, and by it are operated all the switches and signals belonging to the track, extending from the depot back a distance of about half a mile. By this machine all the trains can be handled at any one time by one man.

The most wonderful feature of all this maze of tracks, switches, signals, and operating rods, cranks and levers, is that they are so interlocked with each other that whenever the attendant (human and fallible), by inadvertence, seizes the wrong lever, he finds it locked. Thus he cannot set the signals to clear for a train to move until the switches are all in correct position. The breakage of an actuating rod leading to a signal would leave the signal to the action of gravity, and it is so made and weighted that it would fall to the danger position, and prevent the moving of the train until attended to. Inaction, incapacity, or sleep of attendant simply causes delay. Signals not being cleared, trains are stopped.

Such appliances instated at crossings would evidently provide safety next to absolute, and admit of the passing of trains at nearly, if not quite full speed—indeed at full speed when a rail-junction reversible frog for closing up the rail gaps shall come to be operated along with the derailing switches. Then no stops would be required at crossings, except as two trains, at comparatively long intervals, would happen to require the crossing at nearly the same time. Then the signals and derailing switches would stand against that one which was a moment behind the other in announcing its arrival. It will then necessarily tarry till the first has passed, when the releasing of the “detector bar” will enable the man in the tower to turn the signals and switches just in use back to the danger, thus unlocking the intersecting lines, switches and signals, so that the second train can be passed.

#### A SINGLE TRACK CROSSING ADAPTED FOR SPEED.

The vast importance of the appliances just considered above, as regards their power, safety, and economy for controlling trains at crossings, junctions, overlapping tracks, etc., it is believed, amply entitles them to a more extended description here. To this end, I am under obligations to the Union Switch & Signal Company, of Pittsburgh, Pa., for valuable information, and for means of illustration in the following plates and cuts.

Plate I represents a single track grade crossing as furnished with the appliances by which trains are enabled to pass in safety at speed.

A B is one track, and C D is the other. They intersect, or have their “grade crossing” near the rectangle marked “CABIN.” The latter is the cabin, or tower, as it might be called, because elevated from 10 to 20 feet, in which is placed the interlocking machine, and the “signal-man” for operating it. The interlocking machine will be more fully described hereafter. Briefly, it consists of levers and locking devices, the latter having the function to compel a certain sequence in movement of evers. The levers are connected by means of rods and bell-cranks to the switches

and signals along the tracks, so that when a lever is thrown, there will be a response from the track in the movement of a switch or signal, one or more. Where two switches may always be moved simultaneously, one lever may do it. Also two or more signals may be moved by one lever.

The tracks are shown as crossing at right angles, but they may intersect at any angle.

At W, X, Y and Z, are switches, one in each track, so placed that when open, the train approaching the crossing point will be thrown off the track. Each switch is thus a "facing point" switch for the approaching trains. In the present case they will be called derailing switches, because their object is to derail trains which disobey orders as given through the signals. To prevent serious results in possible derailments due to these switches, guard rails are laid down to keep the derailed train on the ties, or if preferred, the switch may be so arranged as to turn the disobedient train into a turnout track which carries the train off to one side, as into a siding, instead of derailing it; this siding, of course, not cutting the crossing main track. Railroad men at first naturally object to this derailing idea, but it is to be observed that this derailing is not intended for an every-day performance; it is only admitted as decidedly the better of two evils, viz.: the cross-collision of two trains in the crossing, or the comparatively harmless derailment of one of them. It is expected that every train approaching the crossing in the absence of others, will be passed in safety at speed. But when, as occasionally will happen, two trains, one on each of the crossing tracks, shall approach at nearly the same time, the first announcing its approach will be passed, while the other must tarry for it. Signals for "*stop*" will then be given to the second train. If it disobeys these signals, or if the train is unmanageable from any cause, it will be derailed as described, instead of smashing into the other train.

For signaling trains as thus indicated, two signal stands are planted at the engineman's side of the track, in each branch from the crossing. One of these is called the "distance signal", placed some 1,500 or more feet from the crossing, and the other, termed the "home signal", is 400 or more feet from the crossing. These are "1" and "2" for the branch track A, plate I; "4" and "3" for the branch B; "5" and "6" for the branch C; and "8" and "7" for the branch D, respectively. These signals will be described subsequently, but here, when spoken of as "*cleared*" will mean *go ahead*, and when said to be at "*danger*" will mean *stop*.

Some systematic and positive announcement of trains is much needed here to prevent any question as to which train has right-of-way when two may approach nearly simultaneously. To this end, there are placed in the signalman's tower, or cabin, one annunciator for each branch track, and operated by wire, mechanically or electrically, from distant points in the track *a*, *b*, *c*, or *d*, respectively. These points may be placed one mile or more from the crossing, the contact of an approaching train with which causes the announcement of the same to the signalman in the tower. The crossing is then immediately set to pass that train.

In case of priority in right-of-way of the roads at the crossing, the points *a*, *b*, *c*, and *d* may be placed at unequal distances as agreed upon by the railroad companies, the one with prior right, for instance, having two miles and the other one. Then the prior company's train at two miles announces itself and is put in possession of the crossing by the signalman, while the other company's train may have been only  $1\frac{1}{2}$  miles from the crossing.

The interlocking machine is so constituted and adjusted that when one track is set, or "cleared" for the swift passage of one train, the other track will be found to have its switches locked at derailment, and its signals locked at danger (*stop*).

This locking is absolute and positive, the strength of the signalman being insufficient to break or overcome it, so that it is impossible to set both tracks to clear at the same time. The act of restoring the track just in use to danger unlocks the levers by which the second track may be set to clear, and the second train thus passed.

These preliminaries will enable us to understand more particularly how a train is passed safely at speed.

First—It is to be understood, that while the crossing is not in use, all the signals are placed at "danger," and the four switches are placed at "derailment." This may be called the normal condition of the switches and signals while not employed for passing trains.

Second—Suppose a train approaches on the track A; when it makes contact with A, the annunciator in the tower tells the signalman that a train is approaching on track A; prepare at once for its safe passage without stopping. Then the signalman seizes the lever which works the switches W and X, throws it over, and thus sets both these switches to "safety" (*i. e.*, to prevent derailment on track A B). As soon as this is done, the lever thus moved throws the dogs or bolts, which locks the lever, by which the switches Y and Z are set to safety. Thus the latter *cannot* be set to safety till W and X are again set back to derailment. At the same time the signals along the track C D remain locked up at "danger," so that when the first move is made for clearing track A B, the track C D is absolutely locked out.

The movement of the lever, setting W and X to safety, not only locks C D out, but unlocks the lever for clearing signals 1 and 2, so that these signals cannot be cleared until the track A B is first made safe. Again, the movement of the lever clearing 1 and 2 not only does this service, but the same movement locks up the lever to the switches W and X, so that it is impossible to throw these switches back till after 1 and 2 are restored to "danger."

When the train has passed, the signals 1 and 2 may be restored to danger, thus unlocking lever to switches W and X. Then W and X must be set to derailment before the levers for the track C D are unlocked.

Thus one train has been passed over the crossing at speed while the crossing track had open and locked switches, ready to derail or turn into a side track any train willfully or accidentally approaching on it.

Third—A train approaching on the branch B is announced from *b*, whereupon X and W are set to safety, thus locking up Y and Z, and unlocking 4 and 3. Then, clearing the latter, locks up X and W. When train is passed, restoring 4 and 3 to danger, unlocks X and W, then returning the latter to danger, unlocks Y and Z.

Fourth—The same may be said of the branches C and D as of A and B, because one branch is exactly the duplicate of another, as shown on Plate I—that is, when one track is in use the other is locked up, etc., and *vice versa*.

Thus it appears that the signalman cannot go wrong if he simply observes whether the train is from A or B, so that after setting W and X he sets 1 and 2 for A, or 4 and 3 for B. When the train approaches on A the signals should remain at danger and thus locked, to prevent a train from B (simultaneously approaching) from

running into the crossing while the train from A occupies it. After 1 and 2 are put to danger, 4 and 3 may be put to safety.

It thus appears that all points of danger are guarded, except the possible willful return of signals to danger and unlocking of switches, so that they may be opened before a long train may have fully passed them. In such event the train would be broken, the part not having passed the switch when opened being derailed. This danger is avoided by the so-called "detector-bar," a bar say 50 feet in length, which is placed near the rail at switch, and so mounted on links, that if the throwing of switch is attempted, the detector-bar is thrown up and strikes the passing wheel, thus preventing the attempt. The detector-bar is to be worked simultaneously with the switch and with the same lever. With the detector-bar attachment it appears that a switch cannot possibly be thrown while in use by a passing train.

The four positions assumed by the switches and signals are indicated in the marginal diagrams on the right of plate I.

The term "hydraulic" shown on the diagram has reference to connections by means of hydraulic pressure in pipes, instead of by rods, and will be subsequently explained.

Briefly, suppose one lever works W and X; another, Y and Z; another, 1 and 2; another, 3 and 4; another, 5 and 6; another, 7 and 8. There will then be 6 levers to the interlocking machine, as stated on plate I, and the operations may be thus stated. Clearing W and X, locks Y and Z at danger, and unlocks 1 and 2, or 3 and 4. Clearing 1 and 2, locks W and X at safety, and also 3 and 4 at danger. After passage of train, returning 1 and 2, unlocks W, X, 3 and 4. Then 3 and 4 might be set to clear, thus locking W and X to safety, and 1 and 2 at danger for passing a train from B to A. Returning 3 and 4, unlocks W, X, 1 and 2. Now, if W and X are returned to danger, 1, 2, 3 and 4 are locked at danger, and Y and Z are unlocked, and the apparatus is as at first.

The same description of operations applies to track C D, as has been given for track A and B.

#### A DOUBLE TRACK CROSSING ADAPTED FOR SPEED.

The same appliances are used here as in the single track crossing.

It is to be understood that on any one of the four tracks the trains are always moved in the same direction. The directions may be assumed at pleasure, say as shown by the arrows on Plate II. The positions of switches and signals can be determined when these directions are fixed, the positions shown being correct for the directions. But had the directions, for instance, on tracks A and B been contrary, the tracks G and F, with their switches and signals, should be interchanged—that is, F F placed at G G, and G G placed at F F. In that event, the signals 1, 2, 3 and 4 would come to stand between the tracks, so as to be standing on the engineer's side of track.

The normal condition of all switches is for derailment, and of all signals is for danger, when not in use for passing trains.

Taking the diagram shown on Plate II, as representing an actual case, with switches all open for derailment, and signals all at danger; then, when a train approaches, say on branch A, the contact at A is announced to the signalman in the



cabin, whereupon switch W is set to line or safety, thus locking switches Y and Z, and unlocking signals 1 and 2, which latter are then set to clear, and the train passed at speed. When 1 and 2 are cleared, W is locked as in single track crossings. After the train has passed, signals 1 and 2 are returned to danger, thus unlocking W; and when W is returned to derailment, Y and Z are unlocked again. The same may be said of all the branches.

In this case, when W is set to main line, X may or may not be simultaneously set. To work W and X independently, however, requires an extra lever in the interlocking machine.

There is obviously no objection to setting parallel tracks, as A and B, simultaneously to clear, so that two trains may pass each other at speed at the crossing as well as at other points of these lines.

Briefly, when the switches W, X, Y and Z, each has a lever, and when the pairs of signals of each track each has its lever, there will be 8 levers, and the operations possible may be thus stated. Clearing W, locks Y and Z at danger, and unlocks 1 and 2. Then clearing 1 and 2, locks W. After passage of train, returning 1 and 2 to danger, unlocks W. Returning W to danger, unlocks Y and Z.

Similarly, clearing Y, locks W and X at danger, and unlocks 5 and 6. Then clearing 5 and 6, locks Y. After passage of train over track C, the returning of 5 and 6 to danger, unlocks Y. Returning Y to danger, unlocks W and X.

If two trains moving, as indicated by the arrows, on parallel tracks C and D should simultaneously want the crossing, then Z, 7 and 8 may be worked at the same time with Y, 5 and 6; and thus both trains passed by at one time. But it is to be understood that when either or both switches Y or Z are set to clear, the switches W and X are locked. The same may be said of either set of double track.

But when the switches W and X are worked by one lever simultaneously, also Y and Z by another, there will be but 6 levers. Then when W is placed at safety, X will also be set to safety, and Y and Z locked. Then 1 and 2 only may be closed, or 3 and 4 only, or both together, as may be required.

The detector-bar may be employed here as well as in the single track crossing.

In the above we have only spoken of trains, but of course engines alone may pass under the same *regime*.

Marginal diagrams on Plate II show the six conditions under which the crossing can be worked.

In the above description of the operations with interlocking appliances at grade-crossing, the apparatus itself is spoken of as though understood by the reader. But where desired, a full description will be found under interlocking switch and signal appliances.

#### DOUBLE TRACK JUNCTION.

A double track junction involves in one sense a crossing. Though in this case all trains may be controlled by one company, yet even the occurrence of wild trains, belated trains, etc., make it desirable that the trains be flagged or signaled, to say nothing of the greater convenience of the machinery, by which the switches and signals can be operated by one man from a central tower for ordinary schedule trains.

Plate III represents a double track junction, fitted up with the interlocking apparatus. The frogs R, R, R, R are seen to be situated as in an ordinary crossing of like angle. Hence, trains from F to H, or from E to B should stop in the absence of flagmen. Ordinarily we have the switches A and B.

But for the interlocking appliances, by which the trains may be passed at speed, there is to be added a derailing switch V in each of the tracks G and E, as shown, distant signals J K L, and home signals J<sup>1</sup>, K<sub>1</sub>, K<sup>2</sup> and L<sup>1</sup>, as shown. Also annunciators in the cabin operated from distant points in the track E, F and G. The interlocking machine, by which all signals and switches, including V, V, A and B, are to be worked by interlock, is to be located in the cabin or tower Z. Rods, or hydraulic pressure in pipes, may be used to transmit motion to the switches and signals. The directions of trains are indicated by arrows.

Now, when no trains are passing at the junction, the normal condition of the appliances is for *all* signals to be at danger; also for switch V, in track G, to be open, or at danger; and switches A in track F, B, and V in track E, to be at safety or closed. This is preferred for the normal condition by Mr. Harvey Tilden, to whom many of the improvements in the interlocking appliances are due.

For convenience, call V, in track E, V<sub>e</sub>; and V, in track G, V<sub>g</sub>. Respecting the switches, and levers operating them, A is to be worked by one lever, while B, V<sub>e</sub> and V<sub>g</sub> may be all simultaneously thrown by one lever in every case, unless too laborious. We will consider them worked by one lever, though in practice two may be used for one.

Respecting the simultaneous movement of B, V<sub>e</sub> and V<sub>g</sub>: when B and V<sub>e</sub> are closed for the main line, V<sub>g</sub> will be open; when B and V<sub>e</sub> are open for the main line, B and V<sub>g</sub> must be closed for the branch line G. Respecting the interlocking of the above three switches with A: when A is closed for the main line F, V<sub>e</sub> may be either open or closed. When V<sub>e</sub> is closed, A is locked to closure in its main line. But when V<sub>e</sub> is open, A is unlocked, and may be set to the branch H.

Thus a train can not pass over F, A and H unless V<sub>e</sub> is open for derailing, or turning into a siding, any train bound in on E. Also it is seen that the combined action above explained of B, V<sub>e</sub> and V<sub>g</sub> is such that for a train to move in over G, V<sub>g</sub> and B safely, V<sub>e</sub> must be open.

Respecting the levers and signals, J and J<sup>1</sup> are worked by one lever, K and K<sub>1</sub> by one lever. K and K<sup>2</sup> by one lever, and L and L<sup>1</sup> by one lever.

Respecting the interlocking of switches and signals, when A is set for the main line, K and K<sub>1</sub> is unlocked.

Respecting the interlocking of signals and switches, when all is in the normal condition as described, the lever for signals L and L<sup>1</sup> is locked at danger by the position of B, V<sub>g</sub> and V<sub>e</sub>, but the other signals are not locked. Now, signals J and J<sup>1</sup> may be set to safety, or cleared, which locks B, V<sub>g</sub> and V<sub>e</sub>, and a train may be passed over E. Again, signals K and K<sup>1</sup> may be cleared, which act locks A, and a train may be passed over F. These trains may be passed separately, or simultaneously. When trains have passed by, the signals must at once be set back to danger, thus unlocking the switches and returning all to the normal condition again.

Next, to pass trains over the branch tracks, first throw the lever for B, V<sub>g</sub> and V<sub>e</sub>, thus closing B and V<sub>g</sub> for the branch, and opening V<sub>e</sub> for derailment. This locks signals J and J<sup>1</sup> at danger, unlocks signals L and L<sup>1</sup>, and unlocks switch A.

Then signals L and L<sup>1</sup> may be cleared, thus locking switches B, V<sub>G</sub> and V<sub>e</sub>, and a train may safely move in over track G and switches V<sub>G</sub> and B. Also, A being unlocked, as just stated, it may now be set for the branch H. This act unlocks signals K and K<sup>2</sup>, which latter may be cleared, and a train passed out over F A and H in safety. This passage of trains over the branches, as just described, may be done separately or simultaneously.

It should be stated that when A is set for the branch H, signals K and K<sup>1</sup> are locked, and when A is set for mail line, signals K and K<sup>2</sup> are locked. Also, there may be but one signal at K<sup>1</sup>, K<sup>2</sup> being dispensed with, except it may be desirable to indicate to the engineman or conductor approaching on F whether the switch is set for the main line or the branch, because, evidently, if A can only be set for the branch when derailing switch V<sub>e</sub> is open, as above explained, then there would be necessity for only one set of signals K, that set always being cleared for A, set to either the main line or the branch.

While switches B, V<sub>G</sub> and V<sub>e</sub> are set as stated for use of the branch G, it appears that A may be set either way, viz., for the main line or the branch, so that one train may be passing in over G, V<sub>G</sub> and B, or over F A, either separately or simultaneously.

When the trains have all passed over the branches, and the junction again not in use by passing trains, the switches and signals may all be set back again to the normal condition above mentioned.

All the locking and unlocking spoken of above has reference to the interlocking machine itself, which is situated in the tower. In this it is to be observed, that when a lever is thrown which locks another, the same remains locked until the first lever is returned to the former position. One lever may thus be placed subject to two, or even any desired number of other levers. This locking is not to be confounded with the *switch locks* subsequently described.

The "detector-bar" can be applied to the switches A and B, to prevent the cutting of trains while going over the switches, by a careless throwing of the switches while trains are in motion. It is the detector-bar which locks the signals, which latter locks the switch—that is, suppose the train is moving from F over A, to the branch H. The signals K were last cleared to say "all right; go ahead" to the engineman. That clearing of signals locked A, so that A is safe in position so long as the signals K are cleared. But as soon as the *engine* passes signals K, the latter are not required further, because an engineman never looks back for directions from such signals. Hence, the signalman may now return signals K to danger. This, it is observed, unlocks A, so that, if careless, the signalman may now, while the long space of a body of a car is over the switch A, thus freeing it, throw the switch A over to main line, thus sending the rear part of the train down the main line while the forward part has gone up the branch. This is to be avoided by the detector-bar, the latter being a positive lock to switch A while in use for a train, and only while thus in use. Hence, as soon as the train passes entirely over A, it can be returned to the usual position.

Annunciators may be used in the present case as well as in crossings, to give notice of the approach of trains.

Various positions of switches and signals of the junction are shown in the marginal diagrams of Plate III, all of which are protected by interlocking, as above de-

scribed. The working of the appliances for producing the positions indicated may be traced out by any one who has carefully read the foregoing.

#### THE INTERLOCKING APPLIANCES.

In the descriptions above given, of the application of interlocking apparatus, no effort has been made to describe the apparatus itself, the only aim having been to show the wonderful power of the appliances for controlling and handling trains. To these ends it is seen to have great efficiency, both as regards safety, expedition, and concentration of movements of switches, signals, etc., under the hand of one man.

The results pointed out above as obtainable with the interlocking appliances, will be admitted by all as very desirable in railroading, especially where rapid and safe handling is essential. The old stub switch, waited on by a brakeman from each train, is too slow. Though the desirableness and worth of such a method as described is conceded, yet the existence of appliances of such extraordinary powers may be doubted as possible, and thus the whole matter may by some be passed by with indifference. To prove that apparatus of the most perfect character for this purpose is already a tangible reality, the following description is given. For much valuable information, cuts, and means of illustration for this, I am under obligations to the Union Switch and Signal Co. of Pittsburg, and to Mr. Harvey Tilden and Mr. F. S. Guerber.

Though the forms and varieties of parts of apparatus already in use vary considerably, yet we will only attempt to describe here one complete set for the so-called mechanical interlocking, and one for the hydraulic interlocking machines, with the accompanying switches, signals, etc.

#### FIRST. MECHANICAL INTERLOCKING.

The various parts to be described and connected consist of signals, such as those at J, J<sup>1</sup>; K, K<sup>1</sup>, etc. Plate III: switches such as at A, B, V &c. *ib.*; the interlocking machine proper which is placed in the cabin; the lock in the switch itself; the detector-bar, and the rods, bell-cranks, etc., for connecting and transmitting.

One form of signal is shown in the cut Fig. 7, which is a semaphore A set on what appears to be a wooden post. Most of those, however, which I have seen in use, have open posts of iron work, and after designs which, for elegance, altogether eclipse the one shown.

The semaphore blade, A, is pivoted at B so that it will swing in a vertical plane. At L is placed a lamp for use in the night, when A cannot be seen. The lamp itself throws a white light, but the pivot B has attached a frame Brg, set with colored glass for screening the light. This screen and A move together, so that the motion of the signal is the same by night or day. As the language of A, and of the light is made identical, it is immaterial whether one or the other be observed, or both, as at dusk or dawn of day.

The blade A is usually painted red or green on the side facing trains to be governed, and the screen, r, is red or green, respectively. The opposite sides may be white, or may be obscured by making A black, and putting an opaque back on the lamp L.

At C is a short link, or crank, from which a connecting rod extends to the bar D W, pivoted at D. A counter weight

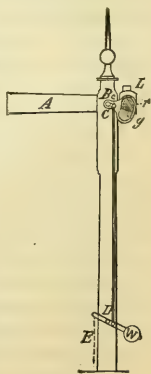


Fig. 7. SIGNAL.

W, is attached so that when the apparatus of the post is left to itself, W falls by gravity till A is brought to the horizontal, or danger position.

The rod E goes downward to an elbow lever, or bell-crank, to which the operating rod from the cabin is attached.

Now, when A is painted red, the horizontal position, as shown in the cut means "stop." For this position the light will also be red. When A is depressed at an angle of about 60 degrees, the signal means "*all clear*." For this position the red screen  $r$  should be so raised by the movement as to show a white light, meaning "*clear*" also.

If A is painted green and the screen  $r$  is green, the horizontal position of A, means "proceed with caution," or with train under control. This, for example, is sometimes necessary in yards where much switching is done, and these green signals may be placed at the yard limits. When at 60° and a white light, this signal means *all clear*.

If from any cause of failure the signal becomes inoperative, as by breakage, or disconnection of the rods from E to the tower, often a thousand feet or more distant, the counter weight W throws the signal to "danger," and the train is stopped. In this way attention is called to the failure of a signal, even though out of sight of the signalman in the tower, by being distant on a curve. But should A fall to the "safety" or "cleared" position instead of the "danger" by possible failure of apparatus, the train might move on to difficulty. Though these appliances are of the most substantial character, and failures of parts are extremely rare, yet it is seen that even these rare chances for accident are provided against.

The switch, its lock, and detector-bar are shown in Fig. 8. The switch itself is an ordinary so-called "split-switch," and will need no further description. The "rod to lever in cabin" seen attached to the switch points, will serve to show how the switch-rails or pointed rails are worked. The bolt, by which the switch is locked in one position or the other, is shown at B. The lever A, and "rod to lever in signal cabin," as shown, will serve to indicate how the bolt is thrown and withdrawn. This bolt, when thrown, enters a notch in the first coupling rod, connecting across from point to point of switch, and thus locks that rod, and consequently the switch to its position. There being a notch for each position of switch, the latter is locked for the one or for the other position.

To move the switch over, the bolt is first withdrawn, then the switch thrown, and then the bolt returned into the second notch, relocking the switch; two levers, according to the cut, being employed. There are devices, however, by which both are worked by one lever in the cabin.

The bolt may be given a strong taper with two advantages; first, to enable it the more readily to find the notch; and second, to serve as a wedge to force the switch points home. In case of obstructions in the switch, such as a rail spike, or a pebble, the bolt can only be but partially thrown, preventing the connected lever in the tower from going clear over, and thus leaving the signal locked at danger till the obstruction is removed.

The detector-bar T, or "locking bar", as given in the cut, is worked by a rod shown as attached to the same lever A, which works the bolt B. Sub-Fig. 13 shows how the bar is mounted on links  $l$ , swinging from the full-line to the dotted-line positions. The end view, sub-Fig. 12, shows the bar, the rail, and a car wheel in

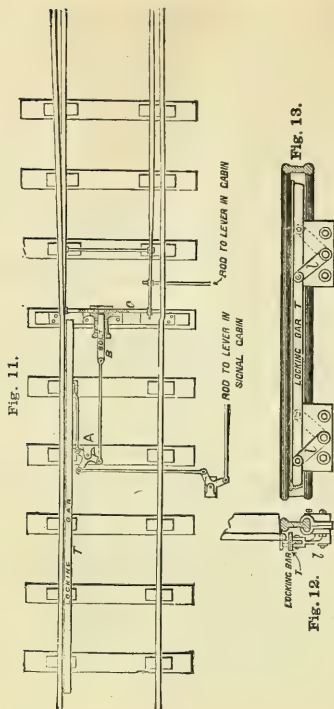


Fig. 8. SWITCH, LOCK, AND DETECTOR-BAR.

position. Studying the two figures together, it is seen that the detector-bar *T* cannot be thrown over from the full to the dotted-line positions of *l*, without the bar being raised up to strike the flange of the wheel. Hence, the bar can never be thrown one way or the other while a wheel is over it.

Now, the bar is made longer than any space between the consecutive wheels of any car. The longest U. S. postal cars of the Lake Shore Road being 68 feet, buffer to buffer, it would appear that this bar must be 50 feet or more in length. But it may have any length, the links *l* being as numerous as desired, say 5 or 8 feet apart, all along. The stroke of the bolt *B*, rod and lever *A* should be arranged to agree with the limited movement of the bar *T*. Then when a train is passing over the switch, it is plain that the bar *T* cannot be thrown, neither the bolt *B*, which locks the switch, as stated to be desirable in describing applications.

In double track roads where trains move only one way over one track, and the opposite way over other, it may be noted that the switch lock and locking bar are



less needed at "trailing point" than at "facing point" switches. In some cases they are omitted from the former.

The rods which connect the switches and signals to the levers in the cabin or tower, work well when made of iron gas-pipe, screwed together by the couplings,

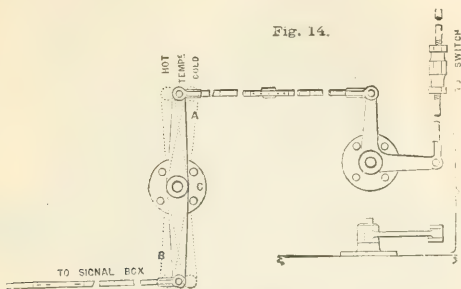


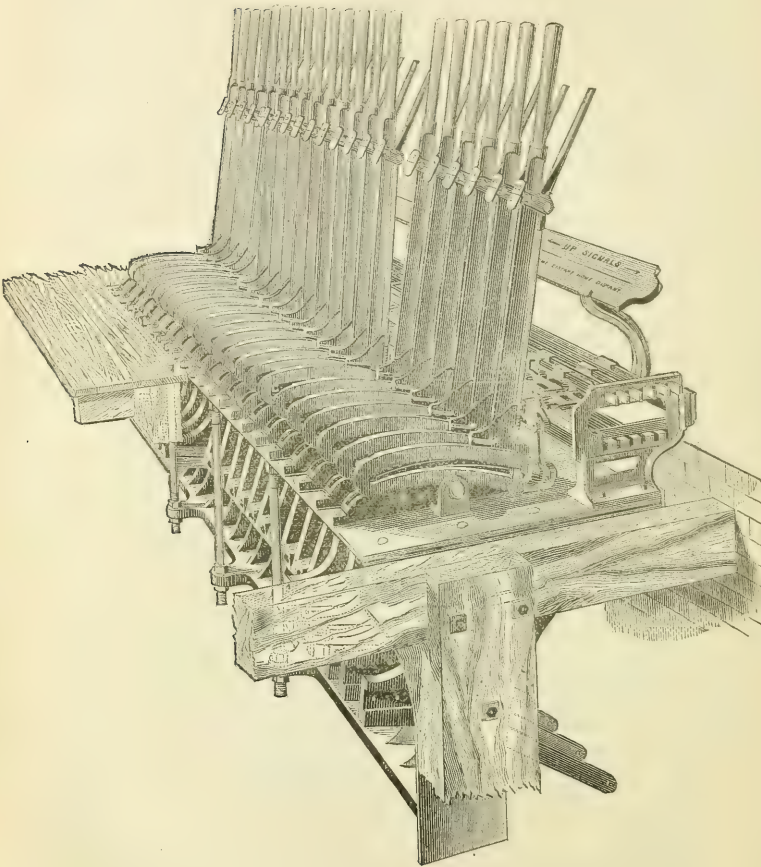
Fig. 9. EXPANSION COMPENSATOR

though sometimes plugs and rivets are put in. Posts are driven deep into the bank at intervals of 5 or 10 feet. These are cut off to line near the surface of the bed or bank. Small stands carrying rollers are placed on the tops of the posts, between which rollers the pipes run and work freely, but from which they cannot be displaced. At points where a change of direction is to be made, a "bell-crank" or angle lever, such as shown in the right of figure, is used. On any ordinary railway curves the rods will lie, and work to the curves without inconvenience. When finished, the rods are boxed up with planks for protection.

It is evident that in rods of such length, as has been mentioned (2000 feet not being unusual), the changes of temperature must be provided for. This is done by a very simple and effectual device, shown in the left-hand part of figure, consisting of a short straight bar A B, placed at the middle of the length of the connecting rod considered. One-half of the rod is then connected at A, and the other half at B. The hot and cold positions of lever A B are shown by dotted lines. Also, for a second device, the angle lever at the right, when placed at the middle, and connected as shown, will compensate. Where extremely long rods are used, and they run through places varying much in condition, as where several hundred feet are in a building, shaded, and other great lengths are in sunshine, or snow-banks, it will be necessary to introduce several compensators, say one in the middle of the shade, and one in the middle of the other part.

The interlocking machine is shown complete in the perspective view in Fig 10, usually known as the Saxby and Farmer Machine. Details of this are shown in Fig. 11.

Fig. 10. THE INTERLOCKING MACHINE.



This latter figure is shown in *Railway Appliances by Barry*, and described in connection with other appliances, less perfect as its forerunners.

The levers are about 6 feet long, and pivoted to a fulcrum at the lower end, placed below the floor of the cabin. The floor is shown in section in one, and perspective in the other cut. The interlocking parts rest on the floor. The rods which

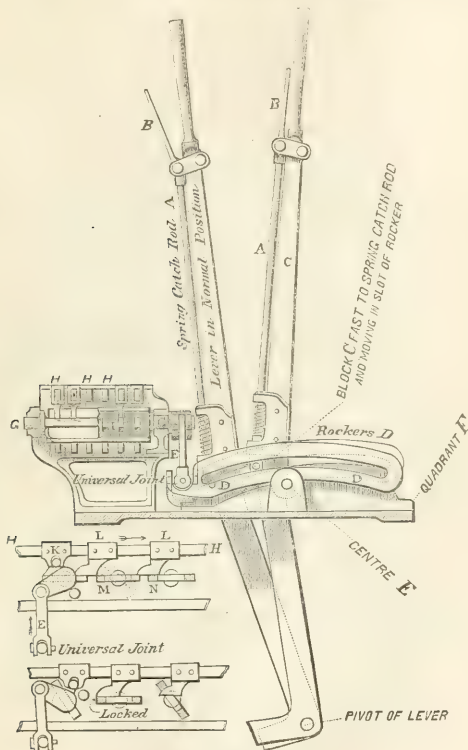


Fig. 11. LEVERS AND LOCKS.

extend from the levers to the signals and switches, are attached to the lower ends of the levers beyond the fulcrums, the levers having L extensions of about a foot length for the purpose. The levers are all alike, some connecting with signals, some with switches, etc. When a lever is thrown, the motion is transmitted to the switch or signal in a manner now understood. When a lever is locked, of course neither the lever nor the switch is movable.

It only remains to explain the locking and interlocking attachments.

For each lever there is a rocker D with curved slot, cut to a radius equal to the distance from the lever fulcrum. These rockers are themselves pivoted to a center E. One end of each rocker is connected by a rod E (not the pivot center E) to a crank best shown in the lower left-hand portion of the cut. This crank is fast on a flat spindle or rock shaft O, the latter having journal bearings at G G. Several of these spindles are shown in end view as at M and N. Each lever has a rocker D, a connecting rod E, a crank, and a spindle, all made alike. Now, it is plain that when a rocker D is moved a small angular distance, the corresponding spindle will rotate through a considerable angle. Some of the different positions due to this partial rotation are shown in the end view of the spindle at M. The horizontal full line position is one extreme, and the most remote dotted line position is the other extreme, in the movement allowed to the spindle M. An intermediate position is also shown at M. All the flat spindles have like connections, bearings and motions.

Now, returning to the main levers, we find attached to each the "latchhandle" B. To B is jointed the "spring catch-rod" A, so called because of the spring and catch at the lower end. Alongside the rocker D is a fixed arc with its edge concentric with the fulcrum of the lever; at each end of which is a notch for the spring catch-rod to drop into. At the side of the catch-rod is a small block attached, which fits and slides in the curved slot of the rocker D. These parts are so adjusted that when the lever is in the "normal position" shown, the catch drops into the notch, throwing B into the position shown as standing out from the lever, and tilting the rocker into the dotted position. But when B is pressed up against the lever, as shown at C, the catch is just raised out of the notch and is ready to slide along the fixed arc just clearing it. The same act of raising the spring catch tilts the rocker D to be exactly concentric with the fixed arc and with the lever fulcrum. Now, the lever may be thrown over to the other end of the arcs, the catch just clearing the fixed arc, and the block sliding freely in the rocker D without moving it. But when the lever is thrown over to its full extent, sliding the block to the opposite end of the rocker, the catch drops into its notch, thus depressing the attached block; also that end of the rocker D.

Hence, it appears that the whole action upon the rocker D, due to throwing over a lever C, is first a raising of say half an inch at one end, then stationary as the lever moves over, then a depression of half an inch at the opposite end of D. In other words, it is a raising of one end of the rocker of one inch, and a depression of the other end of one inch. The connecting link E is also raised or lowered about one inch, in two parts of half an inch each. These parts are shown at M, as regards the motion of the flat spindle.

At H, H, H, etc., is a series of sliding bars, called locking bars, to which the dogs or locks L L, etc., are attached. Any one bar, with its attached dogs, may be slid a small distance forward and back by means of a pin attached to some one of the flat spindles, the same working in a slotted block fast on the bar, as shown at K. Another bar will be moved by another spindle, etc.

All these movements are seen to be definite in extent, a matter which will appear as of importance.

Now, the interlocking can be explained. Consider the spindles O M and N, each with its connected lever. Suppose O and M to be for switches, and N for a

signal. For the positions shown, N is locked by the dog directly over it, so that it cannot be moved from its horizontal position. Hence, the latch-handle B for that lever cannot be raised, and the main lever is held to the notch, immovable; and this signal must remain at danger. But either M or O can be moved at pleasure. If M be moved to the dotted line position, the dog directly over will be prevented from moving to the right, and hence, now not only N but O also is locked. But if O had been moved instead of M, the latter would be locked by the dog directly over, while N would be released. Hence, after O is moved, N can be moved, but M is locked; this complete change being shown in the lower cut of the figure.

The identical arrangement illustrated in this figure exactly applies to Plate III, where the lever to O works the switches B,  $V_g$  and  $V_e$ ; the lever to M works the signals J  $J^1$ ; and the lever to N works the switch A. The normal position of the switches and signals for the junction, Plate III, is seen to correspond to the normal position of the levers when connected as just stated. That is, when the switches are right for trains to pass the junction on the main lines, and with the signals all at danger, the spindles will all lie flat, as in the upper detail cut of Fig. 11. Now, when thus all in the normal condition, if a train approaches on track E, the lever to M can be thrown, and the signals J  $J^1$  can be cleared. But A will be locked by N while B is set for the main line, as shown to be necessary. But the cut indicates that O is free when J and  $J^1$  are at danger, and hence B,  $V_g$  and  $V_e$  may be thrown, placing B and  $V_g$  to safety for the branch, and  $V_e$  to derailment. This locks M, or J and  $J^1$ , and unlocks N, so that A may be now set for the branch. This application of the three levers and spindles O, M and N, to the junction shown on Plate III is only good as far as it goes. The complete interlocking machine for this junction requires several more levers, locks, etc., than shown in the cut of Fig. 11, but the additions required can easily be supplied.

The detail cuts of Fig. 11 serve to indicate the various ways in which locking can be effected. Thus, when the spindles are all lying flat, N is locked while M and O are not. That is, some levers are locked to the normal position while others are not. By throwing M, O is locked, the lock over M pressing against the *outer* edge of M. But if O is moved before M, the latter is locked, and N is released. Then, if N is moved, O is locked in its second position by the lock over N pressing against the *inside* edge of N.

It is plain that this machine may be of any desired magnitude, the one shown in perspective, consisting of 20 levers, being but a pigmy compared with the possible machine. In its growth, one lever, rocker, arc, and spindle may be added after another, *ad libitum*. Also, locking bars may be of any length, and may be placed below as well as above the spindles. Again, if necessary, the spindles may be increased in length, either by so making them or by coupling additional ones to those of the length shown. Thus the machine has boundless capacity.

Attention needs to be called to but one point further, viz.: the stringent precision of the machine. That is, when one lever is to be locked by the movement of another, the locking takes place not when that lever moves a half, a quarter nor even a tenth part of its stroke, but before it makes the least possible part of its stroke. It is to be observed that a lever cannot start in its movement till the spring catch-rod is raised. Also, that the raising of this catch tilts the rocker, together with its spindle. But the construction of the locks and spindles is shown in the cuts to be

such that the moment a spindle is tilted the slightest, the locking is accomplished. Compare M in the cut. Again, when a lever is locked, it is not unlocked until the lever unlocking it is thrown entirely over and its spring catch delivered into the notch, thus completing the tilt of the rocker, and of its spindle. Compare N in its second position, shown in the lower detail cut. Thus, the impossibility of moving one lever until another is fully thrown to its intended position, is assured. When a lever is locked it is not possible to move it in the least, because, first, the spring catch must be raised, and the raising of this tilts the rocker and spindle, which tilting is prevented when the lock is in position for locking. For instance, when a switch is to be moved, thus unlocking its signal then to be cleared, the catch rises, giving the half tilt to the rocker, then the lever is thrown over to turn the switch, and it is not till the catch is lowered into its notch, and the lever secured, that the final tilt is given to the rocker and its spindle, so as to unlock the signal.

#### SECOND: HYDRAULIC INTERLOCKING.

This system differs from the *mechanical*, in that a liquid is forced through pipes, and acts upon pistons for moving switches and signals instead of their being moved directly by rods.

The liquid is brought under a considerable pressure, sufficient to insure the movements, the admission and relief of which, to and from the pipes and pistons, being controlled by an interlocking machine with valves. The machine to be described is that known as the Tilden & Guerber Hydraulic Interlocking Machine.

The switches, signals and switch-locks are the same as in the mechanical interlocking.

The essentials for the system now considered are contained in the interlocking machine shown in Plate IV: An "accumulator" to serve as a reservoir of liquid under pressure; pipes for conducting the liquid from cabin to switches and signals; cylinders, with working pistons, located at the switches and signals; and a "relief tank" for receiving the liquid on its return, and storing it ready for pumping again into the accumulator. Also, a non-freezing liquid is employed in the apparatus, consisting of a mixture of so-called "wood-alcohol" and water.

The chief advantages of this over the mechanical interlocking consist in the greater distance at which switches and signals can be worked (in some actual cases over a mile); the greater operating power placed at command, fixed at pleasure by the accumulator; less troublesome mountings for the transmitting pipes, burying being admissible in the present case; and the greater ease of operation by the signalman.

The accumulator consists of a loaded piston or plunger working in a cylinder, into which the liquid is pumped, thus lifting the piston. If the load be such as to cause a pressure of 100 pounds per square inch, that pressure can be communicated to the pistons located at the switches, etc., by opening the proper valves. A pump may be arranged to automatically work rapidly, slowly, or to stop, according to demand, for returning the exhausted liquid to the accumulator. Thus a given quantity of the liquid may be kept in circulation. The accumulator and pump are much like those used for other purposes.

The interlocking machine is next in the circuit of liquid. It is shown in Plate IV., where the accompanying scale shows it to be a toy in magnitude as compared with



the mechanical interlocking machine. The levers are arranged at the top of a stand the valves at the bottom, and the interlocking mechanism at one side. After studying the Saxby & Farmer machine, a brief description will serve us here. Each lever,  $Z$ , is held in position by a catch entering a notch in an arc, as shown. The catch is released by rotating the cap-handle to the lever, when grasped for throwing it. Throwing a lever slides a slotted plate,  $Y$ , and also moves a vertical bar,  $V$ , carrying blocks secured with nut-screws. Some of these blocks have diagonal slots for receiving pins attached to locking-bars  $H$ . One of the latter is moved lengthwise as a lever is thrown to give motion to a diagonally slotted block.

Now, as shown in the plate, the lever  $Z_1$  is locked by the block  $L_1$  being in contact with the block in  $H$ . But  $Z_2$  is not locked, and may be thrown over. This moves  $H$  endlong by reason of the diagonal slot, and unlocks  $Z_1$ . It also unlocks  $Z_3$  by moving the block  $L_2$  from under the block on  $V_3$ . Then  $Z_3$  may be thrown over, which act throws the block on the second locking-bar, and unlocks  $Z_4$ .

In the side view it is seen that numerous bars,  $H$ , may be introduced. Also, by placing several stands side by side, it is seen that the bars  $H$  may extend from one through to any other, thus showing the machine to be unlimited in capacity.

The slot in the plate  $Y$  has three parts—the first and last thirds being horizontal, and the middle third oblique. A roller on the valve-rod runs in the slot, which causes the valve-rod to be stationary, except for the middle third of the throw of the lever and of the plate  $Y$ . The straight thirds in  $Y$  are to prevent any motion of the valve during the locking and releasing, the latter being confined to the first and last parts of the movements of the levers. Thus no switch or signal is acted upon until the desired locking, or before the desired releasing, is effected.

A general idea of the valves on the base of the interlocking stand is obtained from Plate V. When the valve-stem is raised, there is seen to be a free communication from the accumulator to the switch or signal. Again, when the stem is lowered  $D$  cuts off the pressure of the accumulator, and  $E$  opens a free passage to the relief tank. This, studied in connection with the slotted plate  $Y$  and the locking and releasing thirds, will show that the pressure is kept on during the first third, reversed during the second third, and kept reversed during the last third. This plate only gives a general idea, the refinements of balanced double beat valves, retention of closed  $E$  till  $D$  is closed, etc., not being shown.

*The switch operating cylinder* and accessories constitute a remarkable contrivance. It is shown in Plate VI., almost explaining itself. The piston  $b$  works in the cylinder  $aa^1$  by the action of pressure let on at the interlocking machine through pipes connected as shown. When a valve connects  $a$  with the accumulator, another valve connects  $a^1$  with the relief tank, and *vice versa*. The piston-rod connects with a slotted sliding plate, in which slot-rollers work, sliding two bars transversely, as shown. One bar works the switch, and the other the switch-lock and detector-bar, all shown connected. No description is required to see that, as the piston is moved to the other end of the cylinder, the bolt is first drawn by action of the inclined part of the slot, while the switch stands still; then the switch moves, while the bolt stands still; and, finally, the bolt is returned to lock the switch, while the latter stands still. The two tubes on the left are employed to work the switch, while those on the right are for the signals.

Now, while the switch was moved, the signals should both have been at danger.

This is assured by the valves for the same at the locking-stand having been locked in the position to relieve pressure, because the signals are so counter-weighted as to fall to the danger position when the pressure is not on. The signals are only "cleared" while the pressure is on, so that if any pipe bursts, or other accident causes loss of pressure, the signal falls to danger or "*stop*."

The small valve *g* plays an important part. Its connections, shown clearly, are so adjusted that *g* is just seated as the switch and piston movement is just completed, one way or the other, at *m* or *n*. At *z* and *z*<sup>1</sup> are small check valves, opening toward the large cylinder.

Suppose the switch just moved with *a* still under pressure, as it must be by the action of the interlocking. As this movement is completed, the main line track is clear, and the main line signal is ready to be cleared. Turning the unlocked lever admits pressure along the pipe to *h*, and through *j* to the main line signal, and clearing it. If, however, the pressure should not be maintained in *a*, the check valve *z* opens and relieves the pressure from the signal, and it falls to danger, or "*stop*." This is what would occur, if the pipe to *a* had broken and had failed to move the switch. Again, if a spike had fallen between a switch point and rail, the piston could not have moved clear over, and a wheel flange might enter the open fault at switch point and be derailed. But in such a case the valve *g* would not be seated and the pressure in *h* would be all wasted, through *k* and *z*<sup>1</sup> to *a*<sup>1</sup>, and thus again the signal would not be cleared. The same precautional measures are provided for one as for the other position of switch, the signals always going to danger or "*stop*" in case of any accident to the apparatus, such as breakage of pipe, shortage of liquid, stoppage of pumps, etc. Hence, the degree of safety secured appears to be next to absolute.

#### ANNUNCIATORS AND LOCKS.

Probably the best way for announcing the approach of trains is by means of an insulated section of the track, and electricity.

Rails laid on wooden ties and well connected electrically, are found to be sufficiently insulated for carrying electric currents of comparatively low resistance. Wires, a foot or two in length, are used to connect one rail with the next. The ends of the portions thus insulated and connected must be separated from the rest by insulating plugs, usually of wood, a half inch or more in thickness. A 3 or 4-cell battery current will leak but slightly from one section of rail across to another thus insulated and prepared. Now run a wire from one pole of the battery to the rail on one side, thence to the annunciator board in the cabin, and then to the rail on the other side, opposite the first, and finally to the other pole of the battery. This circuit may have a resistance of 10 to 20 ohms through the annunciator coils and holding up a target by magnetism. Now, if a train runs upon the insulated track, the current is "short-circuited" through the wheels and axles of the tracks, and almost entirely cutting the current out of the annunciator coil. The target then lets go, giving warning of the approach of a train. The signalman then prepares the way. A local circuit may be employed to maintain a rattle upon a bell till the target is again returned to its place ready for the next train to announce itself.

This device of an insulated section of track and battery may be employed to lock a switch or signal lever in the interlocking machine. Thus the whole length of

track between the distant and home signals at crossings and junctions may be insulated, and put in circuit with a magnet holding a bolt up by magnetism to prevent locking. Then the train upon that section destroys the magnetism by short-circuiting the current, and drops the bolt to lock the signals at clear.

# SIGNALS.

Signals and signaling is a matter of vast importance to railways, permeating all parts of its management. It includes various systems, languages, signs, objects, colors, and sounds. There are systems for operating the whole body of trains which are at once on a railway line, and for the different parts of a single train; a whistle, lamp, or flag can transmit a message equivalent to written words; a red flag standing on the side of a track is a sign of danger ahead; at crossings are planted posts and other object signs; lamps and flags are used in various colors; and for sounds, there are used whistles, bells, and torpedoes.

In applying the various means for signaling, there is perhaps as much uniformity as could be expected. In the more common signals there is very nearly perfect uniformity for the whole country. For instance, one blast of the whistle means apply the brakes, two to slack off the brakes, etc. Also, signals by motion with a lantern, appear to be quite uniform, especially for the more frequently needed signals. But the language of blue flags and lights is not uniform. Green flags and lights are used by some roads, while by others not. Some roads employ a much more extended system of signaling with the whistle than others.

There is less inconvenience for non-uniformity of signals where they are confined to the roads to which they are peculiar. But even in this it seems desirable that there be uniformity, for the reason that a man in changing his employment from one road to another will carry the knowledge of signals which he may have with him, and thus be misled by the change in signaling.

For instance, the most ordinary lantern or lamp signals for governing trains by night, differ widely within this State. In one instance the direct contrary in meaning of these signals is in force on two leading roads, whose crossing is at Mansfield. Here the lamp signal for "go ahead" for one is identically the same as the signal for "back" for the other. Again, there are at least four roads whose lamp signals fortunately agree, but which are all crossed by another road with lamp signals in use which are diametrically opposite in meaning.

A tabular view of these cases is given for the signals of a lamp—1st, swung in a circle; 2d, raised and lowered, and 3d, swung crosswise.

CONFLICTING LANGUAGE OF LAMP SIGNALS.

Roads.....	N. Y., P. & O.	P., F. W. & C.	I. B. & W.	B. & O.	Wabash.	C. T. V. & W.
Circle .....	Ahead.	Back.	Back.	Back.	Ahead.	Back.
Up and down .....	Stop.	Ahead.	Ahead.	Ahead.	Back.	Ahead.
Crosswise .....	Back.	Stop.	Stop.	Stop.	Stop.	Stop.

This alarming discrepancy in the meaning of signals is admitted by the railroad people themselves to be not only a source of annoyance, but of danger. As long as operations and men are confined to any one road, there is no inconvenience. But whenever men may change occupation from one road to another, or at road crossings, there at once arises more than inconvenience or annoyance; there is great danger of accident. Suppose a body of freight cars are to be transferred from one to the other; if it happens that the engineer is from one, and the conductor or switchman from the other road, then if both men observe their own signal language, there is accident. If the engineman observes his, and the switchman that of the other road, all is correct; or if the engineman reverses meaning and the switchman not, all is correct. If both reverse meaning there is accident. Hence, it appears, that the chances are equal, whether an accident occurs or not. This could be partially avoided by placing the engineman under instructions to always follow the language of his own road, then the conductor or switchman must attend to allowing for differences.

But a road can retain its peculiar system of signals as long as it is independent of other interests. At railway crossings, however, there are always two railroad interests to be satisfied, and here, perhaps, more than in any other case, there seems to be a need of entire uniformity of both form and language of signals. This necessity is given striking force from the fact that one road may cross twenty or fifty others where possibly there may be as many forms of signal appliances. If those appliances are used in common, the trainmen must learn the peculiarities of all. For instance, suppose a semaphore in diagonal position means "go ahead" for one road, and vertical, the same for the intersecting road. This would work very well here; but such an arrangement could never be adopted a uniform signal arrangement for all crossings, because three roads so crossing as to inclose a triangular area could not all have uniformity. At least one would observe the diagonal for "all right" at one point, and vertical at the other. It seems exceedingly desirable to one who has observed the variety of form and position of signal appliances at crossings, that railroad men should call a convention to agree upon uniformity in such matters for the whole country. Associations of master mechanics, car builders, etc., are doing much valuable service by way of unitizing measures, forms, systems, etc. In the matter of signals, there is an opportunity for railroad superintendents to meet in convention, the work of which, if confined to signals at crossings alone, would, by adopting and causing to be used a uniform system, perform a service far more than compensating all the trouble of the articles of association.

A National Standard Signal Code for Railroads is a desideratum.

TABULATIONS FROM REPORTS

OF

*Railroad and Telegraph Companies.*

TABLE I.—NAME OF ROAD, OWNER, AND OPERATOR OF OHIO RAILROADS.

Name of Road.	Owner.	Operator.
Alliance and Lake Erie Railroad.....	Alliance and Lake Erie Railroad Company.	Alliance and Lake Erie Railroad Company.
Ashtabula and Pittsburgh Railway.....	Ashtabula and Pittsburgh Railway Company.	Pennsylvania Company.
Baltimore and Ohio and Chicago Railroad.....	Baltimore and Ohio and Chicago Railroad Company.	Baltimore and Ohio Railroad Company.
Bowling Green Railroad.....	Bowling Green Railroad Company.	Heldrs of M. T. Wiggins.
Belaire and Northwestern Railway.....	Belaire and Northwestern Railway Company.	Receiver of Marietta and Cincinnati R. R.
Baltimore and Short Line Railway.....	Baltimore Short Line Railway Company.	Receiver of Marietta and Cincinnati R. R.
Central Ohio Railroad Company as reorganized.....	Central Ohio Railroad Company as reorganized.	Chagrin Falls and Southern Railroad Company.
Lake Shore and Michigan Southern Railway.....	Lake Shore and Michigan Southern Railway Company.	Lake Shore and Michigan Southern Railway Company.
Cincinnati and Baltimore Railway.....	Cincinnati and Baltimore Railway Company.	Receiver of Marietta and Cincinnati R. R.
Cincinnati and Eastern Railway.....	Cincinnati and Eastern Railway Company.	Cincinnati and Eastern Railway Company.
Cincinnati, Georgetown and Portsmouth Railroad Co.....	Cincinnati, Georgetown and Portsmouth Railroad Co.	Cincinnati, Georgetown and Portsmouth Railroad Co.
Cincinnati, Hamilton and Dayton Railroad.....	Cincinnati, Hamilton and Dayton Railroad Company.	Cincinnati, Hamilton and Dayton Railroad Company.
Cincinnati, Hamilton and Indianapolis Railroad Comp'y.....	Cincinnati, Hamilton and Indianapolis Railroad Comp'y.	Cincinnati, Hamilton and Dayton Railroad Company.
Cincinnati, Indianapolis, St. Louis and Chicago R'y Co.....	Cincinnati, Indianapolis, St. Louis and Chicago R'y Co.	Cincinnati, Indianapolis, St. Louis and Chicago R'y Co.
Cincinnati and Muskingum Valley Railway.....	Cincinnati and Muskingum Valley Railway Company.	Pittsburgh, Cincinnati and St. Louis Railway Company.
Cincinnati Northern Railway.....	Cincinnati Northern Railway Company.	Cincinnati Northern Railway Company.
Cincinnati, Richmond and Cleveland Railroad.....	Cincinnati, Richmond and Cleveland Railroad Company.	Cincinnati, Hamilton and Dayton Railroad Company.
Cincinnati, Sandusky and Cleveland Railroad.....	Cincinnati, Sandusky and Cleveland Railroad Company.	Indiana, Bloomington and Western Railway Company.
City of Cincinnati.....	City of Cincinnati.	Cincinnati Railroad Company.
Cincinnati and Springfield Railroad.....	Cincinnati and Springfield Railroad Company.	Cincinnati Railroad Company.
Cincinnati, Van Wert and Michigan Railroad.....	Cincinnati, Van Wert and Michigan Railroad Company.	Cincinnati, Van Wert and Michigan Common Carrier Co.
Cincinnati and Westwood Railroad.....	Cincinnati and Westwood Railroad Company.	Cincinnati and Westwood Railroad Company.
Cleveland, Columbus, Cincinnati and Indianapolis R'y Co.....	Cleveland, Columbus, Cincinnati and Indianapolis R'y Co.	Cleveland, Columbus, Cincinnati and Indianapolis R'y Co.
Cleveland and Malone's Valley Railway.....	Cleveland and Malone's Valley Railway Company.	New York, Pennsylvania and Ohio Railroad Company.
Cleveland and Marietta Railroad.....	Cleveland and Marietta Railroad Company.	Cleveland and Marietta Railroad Company.
Cleveland, Mt. Vernon and Delaware Railroad.....	Cleveland, Mt. Vernon and Delaware Railroad Company.	G. A. Jones, Receiver.
Cleveland, Painesville and Ashtabula Railroad.....	Cleveland, Painesville and Ashtabula Railroad Company.	Cleveland, Painesville and Ashtabula Railroad Company.
Cleveland and Pittsburgh Railroad.....	Cleveland and Pittsburgh Railroad Company.	Pennsylvania Company.
Cleveland, Tuscarawas Valley and Wheeling Railway Co.....	Cleveland, Tuscarawas Valley and Wheeling Railway Co.	Cleveland, Tuscarawas Valley and Wheeling Railway Co.
College Hill Railroad.....	College Hill Railroad Company.	College Hill Railroad Company.
Columbus, Chicago and Indiana Central Railway Comp'y.....	Columbus, Chicago and Indiana Central Railway Comp'y.	Pittsburgh, Cincinnati and St. Louis Railway Company.
Columbus and Hocking Valley Railroad.....	Columbus and Hocking Valley Railroad Company.	Columbus and Hocking Valley Railroad Company.
Columbus and Maysville Railway.....	Columbus and Maysville Railway Company.	Cincinnati and Eastern Railway Company.
Columbus, Springfield and Cincinnati Railroad.....	Columbus, Springfield and Cincinnati Railroad Company.	Indiana, Bloomington and Western Railway Company.
Columbus and Toledo Railroad.....	Columbus and Toledo Railroad Company.	Columbus and Toledo Railroad Company.
E. L. Harper, <i>et al.</i> .....	E. L. Harper, <i>et al.</i>	Columbus and Toledo Railroad Company.
Columbus and Xenia Railroad.....	Columbus and Xenia Railroad Company.	Cincinnati, Hamilton and Dayton Railroad Company.
Conotton Valley Railway.....	Conotton Valley Railway Company.	Conotton Valley Railway Company.
Dayton and Michigan Railroad.....	Dayton and Michigan Railroad Company.	Cincinnati, Hamilton and Dayton Railroad Company.
Dayton and Union Railroad.....	Dayton and Union Railroad Company.	Dayton and Union Railroad Company.
W. H. & C. R. Stevens.....	W. H. & C. R. Stevens.	W. H. & C. R. Stevens.
Harrison Branch Railroad.....	Harrison Branch Railroad Company.	Cincinnati, Indianapolis, St. Louis and Chicago R'y Co.
Iron Railroad <sup>16</sup> .....	Iron Railroad Company.	Iron Railroad Company.



Lake Erie and Western Railway.....	Lake Erie and Western Railway Company.....	Lake Erie and Western Railway Company.....
Lake Shore and Michigan Southern Railway.....	Lake Shore and Michigan Southern Railway Company.....	Lake Shore and Michigan Southern Railway Company.....
Lawrence Railroad.....	Lawrence Railroad Company.....	Lawrence Railroad Company.....
Little Miami Railroad.....	Little Miami Railroad Company.....	Little Miami Railroad Company.....
Mahoning Coal Railroad.....	Mahoning Coal Railroad Company.....	Mahoning Coal Railroad Company.....
Maricopa and Cincinnati Railroad.....	Maricopa and Cincinnati Railroad Company.....	Maricopa and Cincinnati Railroad Company.....
Massillon and Cleveland Railroad.....	Massillon and Cleveland Railroad Company.....	Massillon and Cleveland Railroad Company.....
Newark, Somerset and Strasburg Railroad.....	Newark, Somerset and Strasburg Railroad Company.....	Newark, Somerset and Strasburg Railroad Company.....
New York, Pennsylvania and Ohio Railroad.....	New York, Pennsylvania and Ohio Railroad Company.....	New York, Pennsylvania and Ohio Railroad Company.....
Northwestern Ohio Railway.....	Northwestern Ohio Railway Company.....	Northwestern Ohio Railway Company.....
Ohio Central Railroad.....	Ohio Central Railroad Company.....	Ohio Central Railroad Company.....
Ohio and Mississippi Railway.....	Ohio and Mississippi Railway Company.....	Ohio and Mississippi Railway Company.....
Ohio Southern Railroad.....	Ohio Southern Railroad Company.....	Ohio Southern Railroad Company.....
Ohio and West Virginia Railway.....	Ohio and West Virginia Railway Company.....	Ohio and West Virginia Railway Company.....
Painesville and Youngstown Railway.....	Painesville and Youngstown Railway Company.....	Painesville and Youngstown Railway Company.....
Paulding and Cecil Railway.....	Paulding and Cecil Railway Company.....	Paulding and Cecil Railway Company.....
Pittsburgh, Cincinnati and St. Louis Railway.....	Pittsburgh, Cincinnati and St. Louis Railway Company.....	Pittsburgh, Cincinnati and St. Louis Railway Company.....
Pittsburgh, Ft. Wayne and Chicago Railway.....	Pittsburgh, Ft. Wayne and Chicago Railway Company.....	Pittsburgh, Ft. Wayne and Chicago Railway Company.....
Pittsburgh and Lake Erie Railroad.....	Pittsburgh and Lake Erie Railroad Company.....	Pittsburgh and Lake Erie Railroad Company.....
Rocky River Railroad.....	Rocky River Railroad Company.....	Rocky River Railroad Company.....
Sandusky, Mansfield and Newark Railroad.....	Sandusky, Mansfield and Newark Railroad Company.....	Sandusky, Mansfield and Newark Railroad Company.....
Scioto Valley Railway.....	Scioto Valley Railway Company.....	Scioto Valley Railway Company.....
St. Clairsville and Northern Railway.....	St. Clairsville and Northern Railway Company.....	St. Clairsville and Northern Railway Company.....
St. Clairsville Railway.....	St. Clairsville Railway Company.....	St. Clairsville Railway Company.....
Toledo, Ann Arbor and Grand Trunk R'y.....	Toledo, Ann Arbor and Grand Trunk Railway Company.....	Toledo, Ann Arbor and Grand Trunk Railway Company.....
Toledo, Canada Southern and Detroit R'y.....	Toledo, Canada Southern and Detroit Railway Company.....	Toledo, Canada Southern and Detroit Railway Company.....
Toledo, Delphos and Burlington Railroad.....	Toledo, Delphos and Burlington Railroad Company.....	Toledo, Delphos and Burlington Railroad Company.....
Valley Railway.....	Valley Railway Company.....	Valley Railway Company.....
Wabash, St. Louis and Pacific Railway.....	Wabash, St. Louis and Pacific Railway Company.....	Wabash, St. Louis and Pacific Railway Company.....

NOTE.—The above table is made out for June 30, 1881, the date at which the railroad companies file their reports with the Commissioner. The figure references, however, mark the changes that have taken place since June 30, 1881, down to the present time, March 6, 1882, so far as they have been obtained. It will further be noticed, by a reference to the succeeding table of "Mileage and Valuation of Railroads," that many names of railroads are given there, not mentioned in this table. This is owing to the fact that many private coal-roads, switches, and other railroads are included under their general management in this table. They do not make special reports to this office.

<sup>1</sup> Consolidated with Bellaire, Zanesville and Southern Railway Company February 27, 1882, forming Bellaire, Zanesville and Cincinnati Railway Company.  
<sup>2</sup> Leased to Fred. Wolfe, October 1, 1881. A new company.—The Cincinnati, New Orleans and Texas Pacific Railroad Company—was incorporated September 8, 1881, and now controls this road.

<sup>3</sup> Sold Aug. 20, 1881, to H. Smithers. The Cleveland, Akron and Columbus Railroad Company was incorporated Dec. 1, 1881, and now owns and operates the road.  
<sup>4</sup> Oscar Townsend was appointed receiver February 20, 1882.

<sup>5</sup> These roads were consolidated August 20, 1881, forming the Columbus, Hocking Valley and Toledo Railway Company.

<sup>6</sup> Consolidated October 25, 1881, with the T., D. & B. R. Co., forming the Toledo, Delphos and Burlington Railroad Company.

<sup>7</sup> J. H. Stewart and Samuel Woodard were appointed receivers about the 15th of September, 1881.

<sup>8</sup> Consolidated with Atlantic and Northwestern Railway Company January 27, 1882, forming the Ohio Central Railroad Company.

<sup>9</sup> Jno. M. Douglass appointed receiver about October 1, 1881.

<sup>10</sup> A receiver was appointed about February 1, 1882.

<sup>11</sup> Sold to New York, Chicago and St. Louis Railway Company September 1, 1881.

<sup>12</sup> Consolidated with Toledo, Cincinnati and St. Louis Railway Company, forming the Toledo, Cincinnati and St. Louis Railway Company, March 2, 1882.

TABLE II.—RAILWAY LINES IN OPERATION—MILES.

Line, and by whom operated.	Termini.		Single main track.		Double track.	Sidings, etc.	Total.
	Entire line.	In Ohio					
Alliance and Lake Erie Railroad—Company	262.60	25.00		25.00		1.00	26.00
Baltimore and Ohio Railroad—Company	8.40					40.14	30.74
Baltimore and Ohio and Chicago Railroad	137.28			110.31			8.00
Central Ohio Railroad	44.00					37.83	175.12
Newark, Somerset and Staatsville Railroad	116.25					3.82	49.82
Sandusky, Mansfield and Newark Railroad	12.00					21.33	137.98
Belleaire and Southwestern Railway—Company	5.50					43.32	43.32
Bowling Green Railroad—M. T. Wiggins, Lessee.	5.50					5.00	6.00
Chagrin Falls and Southern Railroad—Company	52.50						5.00
Cincinnati and Eastern Railway—Company	11.50						
Columbus and Maysville Railway	19.00						
Hillsboro Short Line	87.00					2.31	89.31
Cincinnati, Georgetown and Portsmouth Railroad—Co.	1.30						1.30
Cincinnati, Hamilton and Dayton Railroad—Company	28.60						29.70
Cincinnati, Hamilton and Indianapolis Railroad	59.925				15.97	1.10	99.67 <sup>a</sup>
Cincinnati, Richmond and Chicago Railroad	98.20					8.90	107.10
Dayton and Michigan Railroad	14.50					2.42 <sup>s</sup>	46.92 <sup>s</sup>
Cincinnati, Indianapolis, St. Louis & Chicago R'y—Co.	110.714					23.615	161.363
Cincinnati, Indianapolis, Ind., to Indianapolis, Ind.	63.90						
Indianapolis, Ind., to Cincinnati, O.	111.00				2.00		
Lawrenceburg Junction to Lawrenceburg	2.49						
Valley Junction, O., to Harrison, O.	177.30					53.80	253.10
Cincinnati, La Fayette and Chicago Railway	7.75					3.81	8.09
Fairland, Franklin and Martinsville Railroad	56.30					7.65	63.95
	38.30					2.92	40.62
Cincinnati Northern Railway—Company	102.55						
Cincinnati Southern Railway—Cincinnati R.R. Co., Director	21.30					1.00	25.20
Cincinnati, Van Wert & Mich. R. R.—C. V. & M. C. C. Co.	375.00					236.00	436.00
Cincinnati and Westwood Railroad—Company	13.10					2.0	13.30
Cleveland, Columbus, Cine. & Indianapolis R'y—Co.	5.65					.53	5.96
Cleveland, Painesville and Ashland Railroad—Co.	138.00						
Cleveland, Tuscawawas Valley and Wheeling R'y—Co.	50.00						
	202.15						
Columbus and Springfield Railway	291.15					119.69	350.87
Cincinnati, Sandusky and Cleveland Railroad	48.05				20.03	14.46	62.51
Cleveland and Marietta Railroad—Company	21.10						21.10
Cleveland, Mt. Vernon and Delaware R. R.—Receiver	98.19					7.90	106.09
Cleveland, Painesville and Ashland Railroad—Co.	149.94					22.75	166.79
Cleveland, Tuscawawas Valley and Wheeling R'y—Co.	7.65					.50	8.15
Cleveland, Tuscawawas Valley and Wheeling R'y—Co.	158.30					15.31	203.81



TABLE II.—RAILWAY LINES IN OPERATION—MILES—Continued.

Line, and by whom operated.	Termini.	Single main track.		Double track.	Sidings, etc.	Total.
		Entire line.	In Ohio.			
Baltimore Shoreline Railway	In Marietta City	30.33	30.33		8.60	38.93
Cincinnati and Baltimore Railway	Salamanca, N. Y., to Dayton, O.	5.80	5.80		6.70	12.50
Marietta City Branch	Franklin Branch, near Meadville, Penn., to Oil City, Penn.	1.26	1.26	5.80		1.26
New York, Pennsylvania and Ohio Railroad—Co.		387.90 <sup>d</sup>	246.27			
(Cleveland and Mahoning Valley Railway	Silver Creek Branch, near Wadsworth, O., to Cleveland, O., to Youngstown, O.	33.78				
	Youngstown, O., to Sharon, Penn.	1.58 <sup>d</sup>	1.58 <sup>d</sup>			
	Niles, O., to New Lisbon, O.	67.00	67.00			
	Vinona Junction, O., to Vienna, O.	14.50	13.00			
	State Line to Sharon, Penn.	35.60	35.60			
Westernman Railroad		7.75				
Sharon Railway		2.09 <sup>d</sup>	0.61 <sup>d</sup>			
		17.19 <sup>d</sup>	567.37 <sup>d</sup>	3d rail 165.25 = 52.62 <sup>d</sup>	169.07	789.06 <sup>d</sup>
Ohio Central Railroad—Company	Toledo, O., to Bremen, O.	160.00	160.00			
	New Lexington, O., to Corning, O.	12.10	12.40			
	Alum Creek, O., to Rush's, O.	24.40	24.40			
P., C. and St. L. Railway	Columbus, O., to Alum Creek, O.	4.30	4.30		16.90	218.60
C. and M. V. Railway	Bremen, O., to New Lexington, O., 11.6 miles included in C. & M. V.		19.52			
Ohio and Mississippi Railway—Receiver	Cincinnati, O., to E. St. Louis, Ills.	338.03				
	N. Vernon, Ind., to Jeffersonville, Ind.	53.31				
	Beardstown, Ills., to Shawneetown, Ills.	224.85				
		616.20			93.03	709.23
Ohio and West Virginia Railway—Company	Logan, O., to Pomeroy, O.	81.91	81.91		6.36	88.27
Painesville and Youngstown Railway—Company	Fairport, O., to Youngstown, O.	61.80	61.80		5.35	67.15
Paulding and Cecil Railway—Company	Cecil, O., to Paulding, O.	6.40	6.10		.90	7.30
Pennsylvania Company—						
Ashtabula and Pittsburgh Railway	Ashtabula, O., to Youngstown, O.	67.30 <sup>d</sup>	62.66 <sup>d</sup>		8.83 <sup>d</sup>	71.41 <sup>d</sup>
Cleveland and Pittsburgh Railroad	Cleveland, O., to Yellow Creek, O.	97.67	97.67			
	Belaire, O., to Rochester, Pa.	68.97	54.64			
	Bayard, O., to New Philadelphia, O.	31.02				
		197.66	31.02	3.52	62.97	264.15
Lawrence Railroad	Lawrence Junction, Pa., to Youngstown, O.	17.98				
	Hazleton, O., to Canfield Coal Mines, O.	4.06	8.62			
		22.04	4.06		3.22	25.26
Massillon and Cleveland R. R.	Massillon, O., to Clinton, O.	12.23	12.23		2.07	14.30
North Western Ohio Railway	Toledo Junction, O., to Toledo, O.	79.98 <sup>d</sup>	79.98 <sup>d</sup>		8.61 <sup>d</sup>	88.60 <sup>d</sup>
Pittsburgh, Fort Wayne and Chicago Railway	Pittsburgh, Pa., to Chicago, Ills.	467.37	251.65 <sup>d</sup>	56.49	173.96	698.42
Pittsburgh and St. Louis Railway—Co.	South Pittsburgh, Pa., to Newark, O.		117.59			
	Newark, O., to Col., O., 33.02, incl'd in C. O. R. R.	138.54				
	Cadiz Junction, O., to Cadiz, O.	7.80				
		166.34	7.80	14.13	55.59	236.36

	1 23	25	13 73	1 23	25	13 73	1 23	25	13 73
<b>Monongehela Exten. of P. R. R. in Pitts., Pa.</b>									
Union Depot Track in Columbus, O.	148.43	25	148.43	148.43	25	148.43	148.43	25	148.43
Columbus, O., to Morrow, O.	187.10		187.10	187.10		187.10	187.10		187.10
Columbus, O., to Indianapolis, Ind.	231.00		231.00	231.00		231.00	231.00		231.00
Madison Junction, O., to Chicago, Ills.	102.29		102.29	102.29		102.29	102.29		102.29
Richmond Junc., Ind., to Anoka Junc., Ind.	60.20		60.20	60.20		60.20	60.20		60.20
Peoria Junction, Ind., to State Line, Ills.	580.50		580.50	580.50		580.50	580.50		580.50
Columbus, O., to Xenia, O.	54.72		54.72	54.72		54.72	54.72		54.72
Dayton, O., to Richmond, Ind.	41.42		41.42	41.42		41.42	41.42		41.42
Cincinnati, O., to Springfield, O.	84.00		84.00	84.00		84.00	84.00		84.00
Dayton, O., to Xenia, O.	16.00		16.00	16.00		16.00	16.00		16.00
Pittsburgh, Pa., to Youngstown, O.	68.00		68.00	68.00		68.00	68.00		68.00
New Castle Junction, Pa., to New Castle, Pa.	2.35		2.35	2.35		2.35	2.35		2.35
Cleveland, O., to Rocky River, O.	97.60		97.60	97.60		97.60	97.60		97.60
Caldwell Junction to Portsmouth Junction.	25.50		25.50	25.50		25.50	25.50		25.50
Sciotoville to Petersburg.	108.87		108.87	108.87		108.87	108.87		108.87
Springfield, O., to Jackson, O.	4.55		4.55	4.55		4.55	4.55		4.55
Jackson to Coalton.	113.42		113.42	113.42		113.42	113.42		113.42
St. Clairsville, O., to St. Clairsville Junction.	3.50		3.50	3.50		3.50	3.50		3.50
St. Clairsville, O., to Quincy, O.	6.65		6.65	6.65		6.65	6.65		6.65
Toledo, O., to Ann Arbor, Mich.	46.00		46.00	46.00		46.00	46.00		46.00
Toledo, O., to Grand Trunk Junction, Mich.	55.87		55.87	55.87		55.87	55.87		55.87
Toledo to Kokomo, Ind.	181.00		181.00	181.00		181.00	181.00		181.00
Delphos to Dayton.	94.90		94.90	94.90		94.90	94.90		94.90
Merer to Shane's Crossing.	4.96		4.96	4.96		4.96	4.96		4.96
Dayton to Wellston.	115.50		115.50	115.50		115.50	115.50		115.50
Cleveland to Canton.	58.70		58.70	58.70		58.70	58.70		58.70
Toledo to Miss. River and No. River Points.	2,558.88		2,558.88	2,558.88		2,558.88	2,558.88		2,558.88
<b>Totals.</b>	12054.63 <sup>2</sup>		5837.17 <sup>8</sup>	5837.17 <sup>8</sup>		457.46 <sup>5</sup>	457.46 <sup>5</sup>		14821.96

\* Road from Newark to Columbus is owned jointly by P., C. & St. L. and Central Ohio Companies.

TABLE III.—LINE LAID WITH RAIL IN OHIO.

Name, and how operated.	Single track.			Double track.	Sidings, etc.	Total rail.	Miles of main track ballasted.	Gauge of track, Inches.	Weight of rail per yard.	
	Branches.		Total.						Steel.	Iron.
	Main line.									
Alliance & Lake Erie R. R.—Company	25.00		25.00		1.00	28.00	2.00	36.00	<i>lbs.</i> 30.00	<i>lbs.</i> 30.00
Baltimore & Ohio R. R. Company										
Balt. & Ohio & Chicago R. R. (stock ownership)	110.31		110.31		18.19	128.50	110.31	56.75	60.00	62 & 64
Central Ohio R. R. (under lease)	(a) 137.29		137.29		37.63	175.12	137.29	56.75	60.00	
Newark, Somerset & Strattsfield R. R. (under lease)	44.00		44.00		8.82	44.82	44.00	56.75		54 & 62
Sandusky, Mansfield & Newark R. R. (under lease)	116.25		116.25		21.73	137.98	116.25	56.75		64.00
Bellaire & Southwestern R'y—Company	42.00		42.00		1.32	43.32	42.00	36.00		35.00
Bowling Green R. R.—Company	5.50		5.50		.50	6.00	5.50	56.50		35.00
Celina, Van Wert & State Line R'y—Co. (till March 5; sold then to C. V. W. & M. R. Co.)	Included	In C. V. W. & M.	5.00			5.00		36.00		30.00
Chegrin Falls & South'n R. R.—Co. (from Feb. 1, '81)	5.00		5.00		2.31	71.61	30.00			38.29
Cincinnati & Eastern R'y—Company	69.30		69.30							
Cincinnati, Georgetown & Portsmouth R. R.—Company (from Sept. 13, 1886)	28.60		28.60		1.10	29.70	16.00	36.00		35 & 40
Cincinnati, Hamilton & Dayton R. R.—Company	59.93		59.93	15.97	23.78	99.68	59.93	57.00	60.00	60.00
Cin., Ham. & Indianapolis R.R. (stock ownership)	19.50		19.50		1.74	21.24	19.50	60.00		60.00
Cincinnati, Richmond & Chicago R. R. (lease)	35.55		35.55		2.43	37.98	35.55	60.00		60.00
Dayton & Michigan R. R. (lease)	140.71		140.71		23.65	164.36	140.71	56.50		60.00
Cin., Indianapolis, St. Louis & Chicago R'y—Co.	20.60		20.60	2.00	13.63	36.23	20.60	56.00		35.00
Harrison Branch R. R. (under lease)	7.01		7.01		.34	7.35		36.00		
Cincinnati Northern R'y—Company	24.20		24.20		1.00	25.20	24.20			
Cin. & Portsmouth R. R.—Receiver (till Sept. 13; sold to C. G. & P. R. R. Co.)	Included	In C. G. & P. R. R.								
Cincinnati R. R. Co.	1.02		1.02							
Cincinnati Southern R'y (under license)										
Cin., Sandusky & Cleveland R. R.—Company (till May 1; leased to I. B. & W.)	154.25	15.51	169.76		20.50	190.26	190.03	60.00	50 & 53	60.00
Col. Sig'd & Cin. R.R. (till May 1; leased to I. B. & W.)	44.37		44.37		2.25	46.62	0.00	56.50	50 & 60	56.00
Cin., Van Wert & Michigan R. R. (by C. V. W. & M. C. C. Co. from March 5; construction contract)	13.10		13.10		20	13.30	13.10	57.00		45.00
Cincinnati & Westwood R. R.—Company	5.63		5.63		.33	5.96	5.00	36.00		35.00
Cleveland, Columbus, Cin. & Indianapolis R'y—Co.	306.60		306.60	18.14	92.81	417.55	306.60	56.50	60.00	60.00
Cincinnati & Springfield R'y (under lease)	48.05		48.05		14.46	62.51	48.05	56.50		50.00
Cleveland & Marietta R. R.—Company	98.19	1.26	99.45		7.90	107.35	98.19	56.50		50.00
Cleveland, Mt. Vernon & Delaware R. R.—Receiver	144.04		144.04		22.75	166.79	144.00	56.50		56.00
Cleveland, Painesville & Ashtabula R. R.—Co.	7.65		7.65		(b) .50	8.15				
Cleveland, Painesville & Valley & Wheeling R'y—Co.	158.50		158.50		46.31	203.81	158.50	56.50	56.00	56.00
College Hill R. R.—Company (from May 1, 1881)	6.00		6.00		.22	6.22		36.00		35.00
Columbus & Hocking Valley R. R.—Company	108.45		108.45		45.36	153.81	108.45	57.00	60.00	56.00
Columbus & Maysville R. R.—Company	18.70		18.70		1.00	19.70		60.00		60.00
Columbus & Toledo R. R.—Company	123.70		123.70		16.51	140.21	117.77	57.00	60.00	60.00
Columbus, Wash'ton & Cin. R. R.—Receiver (till May 21)	20.18		20.18		.07	20.25	None.	36.00		35.00
Corntonon Valley R'y—Company	60.20		60.20		6.78	66.98	27.70	36.00	37.50	30.00
Dayton & Southeastern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R.)	Included	In T. D. & B.								



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Dayton & Union R. R.—Trustees	31.74	31.74	1.78	33.52	31.74	58.00	56.00
Eastern Ohio R. R.—Lessee	7.75	7.75	.05	7.80		56.50	45.00
Indiana, Bloomington & Western R'y Co.							
Cin., Sandusky & Clev. R.R. (Ohio Div. (from May 1)							
Col., Springfield & Cin. R.E.)							
Iron R. R.—Company	18.00	18.00	3.00	21.00		58.00	60.00
Lake Erie & Western R'y—Company	145.70	145.70	11.70	157.40		56.50	56.00
Lake Shore & Mich. Southern R'y (by stock owner-ship and special agreement)	420.81	420.81	221.33	761.84	420.81	60 & 65	45, 50, 56 & 60
Chicago & Canada Southern R'y (by stock owner-ship and special agreement)	4.66	4.66	.28	4.94	4.66	60 & 65	45, 50, 56 & 60
Mahoning Coal R. R. (under lease)						56.50	60.00
Marquette & Cincinnati R. R.—Receiver	275.90	275.90	48.30	327.50	275.90	60.00	60.00
Baltimore & Annapolis R. R.—Receiver	30.30	30.30	8.80	38.90			
Cincinnati & Baltimore R'y (special agreement)	5.80	5.80	6.70	18.30			
New York, Pennsylvania & Ohio R. R.—Company	247.82	247.82	59.85	307.67	247.82	60.00	60.00
(Cleveland & Mahoning Valley R'y (under lease))	124.90	124.90	(d)	124.90	124.90	60.00	60.00
Ohio Central R. R.—Company	197.40	197.40	16.90	214.30	125.00	56.50	56.00
Ohio & Mississippi R'y—Receiver	19.52	19.52	10.40	29.92	19.52	52 to 60	65.00
Ohio & West Virginia R'y—Receiver	81.91	81.91	6.36	88.27	78.27	57.00	52.00
Painesville, Canton & Bridgeport N. G. R. R.—Com-pany and Rec'r (till Feb. 1; sold to C. F. & S.)			5.35	67.15		36.00	35.00
Painesville & Youngstown R'y—Company	61.80	61.80	90	7.30	2.00	56.50	35.00
Paulding & Cecil R'y—Company	6.40	6.40					
Pennsylvania Company							
Ashtabula & Pittsburgh R'y (under lease)	62.60	62.60	8.84	71.44	62.60	57.00	56.00
Cleveland & Pittsburgh R. R. (under lease)	182.73	182.73	54.01	240.26	182.73	57.00	60.00
Lawrence R. R. (under lease)	12.68	12.68	1.13	13.81	12.68	57.00	60.00
Massillon & Cleveland R. R. (under lease)	12.23	12.23	1.40	13.63	12.23	57.00	56.00
Northwestern Ohio R'y (under lease)	79.98	79.98	8.62	88.60	79.98	57.00	52.00
Pittsburgh, Ft. Wayne & Chicago R'y (under lease)	251.66	251.66	70.06	321.72	251.66	57.00	60 & 67
Pittsburgh, Cincinnati & St. Louis R'y—Company	125.39	125.39	45.17	170.56	127.18	57.00	60 & 64
Cincinnati & Muskingum Valley R'y (under lease)	148.45	148.45	13.73	162.18	148.45	57.00	56 & 60
Columbus, Chi. & Indiana Central R'y (under lease)	135.90	135.90	25.40	161.30	127.50	57.00	60.00
Columbus & Xenia R. R. (under lease)							
Little Miami R'y (under lease)	191.95	191.95	29.14	246.58	217.84	57.00	60.00
Pittsburgh & Lake Erie R. R.—Company	9.20	9.20	2.41	11.61	9.20	56.50	60.00
Rocky River R. R.—Company	5.53	5.53	36	5.89	5.53		
Scioto Valley R'y—Company	121.10	123.10	6.42	129.52	123.10	56.75	50 & 58
Springfield Southern R. R.—Company	113.42	113.42	8.79	122.21	122.21	56.50	37.50
St. Clairsville and Northern R'y—Company	3.50	3.50	.35	3.50		36.00	30.00
St. Clairsville R'y—Company	6.65	6.65		7.00	6.65	36.00	30.00
Toledo, Ann Arbor & Grand Trunk R'y—Co. (from October 15)	5.00	5.00		5.00	5.00	56.50	50.00
Toledo, Canada Southern & Detroit R'y (by C. S. R'y Co.; stock ownership)	8.60	8.60	9.25	17.85	8.60	56.50	60.00
Toledo, Delphos & Burlington R. R.—Company	310.40	310.40	16.23	330.63	210.00	86.00	35.00
Valley Railway—Company	58.70	58.70	10.81	71.51	58.70	56.75	56.00
Wabash, St. Louis & Pacific R'y—Company	75.00	75.00	41.80	116.80	75.00	56.50	56.00
Totals	(c) 5,812.46	(c) 5,833.23	1,188.74	7,217.99	5,156.35		

(a) The Central Ohio and the P. C. & St. L. jointly own and operate 33.02 from Newark to Columbus. This is subtracted from the mileage of the P. C. & St. L. in this table. (b) From report of 1890. (c) White Water Valley R. R., 2.10 not reported, making a total of 5,835.33. (d) Sidings not reported. See Included in C. S. & C.

TABLE IV.—RAILWAY MILEAGE IN COUNTIES.

Counties.	Company.	Single track.			Double track.	Sidings, etc.	Total rail.
		Main line.	Branches.	Total.			
Adams .....	Cincinnati and Eastern Railroad .....	1.53	.....	1.53	.....	.30	1.83
Allen .....	Dayton and Michigan Railroad .....	17.61	.....	17.61	.....	4.00	21.61
	Lake Erie and Western Railway .....	23.30	.....	23.30	.....	2.70	26.00
	Pittsburgh, Ft. Wayne and Chicago Railway .....	25.96	.....	25.96	.....	6.45	32.41
Ashtand .....	Toledo, Delphos and Burlington Railroad .....	14.20	.....	14.20	.....	1.47	15.67
	New York, Pennsylvania and Ohio Railroad .....	20.91	.....	20.91	.....	2.74	23.65
Ashtabula ..	Pittsburgh, Ft. Wayne and Chicago Railway .....	8.13	.....	8.13	.....	1.97	10.10
	Ashtabula and Pittsburgh Railway .....	29.06	.....	29.06	.....	5.83	34.89
Athens .....	Lake shore and Michigan Southern Railway .....	27.78	40.98	68.76	27.78	19.27	115.81
	Columbus and Hocking Valley Railroad .....	16.95	7.12	24.07	.....	8.37	32.44
	Marietta and Cincinnati Railroad .....	16.30	10.30	26.60	.....	8.70	35.30
Auglaize ....	Baltimore Short Line Railway .....	21.20	.....	21.20	.....	2.85	24.05
	Dayton and Michigan Railroad .....	12.62	.....	12.62	.....	.96	13.58
	Lake Erie and Western Railway .....	16.00	9.20	25.20	.....	2.30	27.50
Belmont .....	Central Ohio Railroad .....	31.82	.....	31.82	.....	7.60	39.42
	Cleveland and Pittsburgh Railroad .....	10.45	.....	10.45	.....	2.78	13.23
	Bellaire and Southwestern Railway .....	27.50	.....	27.50	.....	1.07	28.57
	St. Clairsville and Northern Railway .....	3.50	.....	3.50	.....	.....	3.50
	St. Clairsville Railway .....	6.65	.....	6.65	.....	.35	7.00
Brown .....	Cleveland, Tuscarawas Valley and Wheeling R'y .....	33.91	.....	33.91	.....	4.90	38.81
	Cincinnati and Eastern Railroad .....	20.19	.....	20.19	.....	.38	20.57
	Columbus and Maysville Railway .....	1.60	.....	1.60	.....	.30	1.90
Butler .....	Cincinnati, Hamilton and Dayton Railroad .....	24.13	.....	24.13	5.12	6.52	35.77
	Cincinnati, Hamilton and Indianapolis Railroad .....	19.50	.....	19.50	.....	1.74	21.24
	Cincinnati, Richmond and Chicago Railroad .....	12.03	.....	12.03	.....	.80	12.83
	Cincinnati and Springfield Railway .....	19.74	.....	19.74	.....	4.13	23.87
	Cincinnati Northern Railway .....	1.10	.....	1.10	.....	.....	1.10
Carroll .....	Cleveland and Pittsburgh Railroad .....	11.49	.....	11.49	.....	.58	12.07
	Connofton Valley Railway .....	21.80	.....	21.80	.....	2.75	24.55
Champaign ..	New York, Pennsylvania and Ohio Railroad .....	21.28	.....	21.28	.....	5.19	26.47

Champaign ..	Cleve., Columbus, Cincinnati and Indianapolis R'y..	10.61	10.61	1.50	12.11
	Columbus, Chicago and Indiana Central Railroad.....	30.36	30.36	5.85	36.21
	Cincinnati, Sandusky and Cleveland Railroad.....	15.85	15.85	.69	16.54
Clarke .....	New York, Pennsylvania and Ohio Railroad.....	18.26	18.26	.98	19.24
	Cincinnati, Sandusky and Cleveland Railroad.....	21.30	21.30	3.60	24.90
	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	11.04	11.04	3.57	14.61
	Columbus, Springfield and Cincinnati Railroad.....	14.50	14.50	.25	14.75
	Columbus and Xenia Railroad.....	9.66	9.66	1.02	10.68
	Little Miami Railroad.....	7.85	7.85	.87	8.72
	Ohio Southern Railroad.....	15.93	15.93	2.99	18.92
Clermont.....	Cincinnati and Eastern Railroad.....	20.98	20.98	.86	33.31
	Little Miami Railroad.....	6.15	6.15	.73	18.03
	Marietta and Cincinnati Railroad.....	5.00	5.00	.80	5.80
	Cincinnati, Georgetown and Portsmouth Railroad...	18.20	18.20	.40	18.60
Clinton .....	Cincinnati and Muskingum Valley Railway.....	23.59	23.59	1.52	25.11
	Marietta and Cincinnati Railroad.....	17.80	17.80	4.20	33.10
	Columbus, Washington and Cincinnati Railroad.....	11.48	11.48	.02	11.50
Columbiana	Cleveland and Mahoning Valley Railway. (a)				
	Cleveland and Pittsburgh Railroad.....	44.87	44.87	12.68	59.19
	Pittsburgh, Ft. Wayne and Chicago Railway.....	23.73	23.73	7.46	31.19
Coshocton ..	Pittsburgh, Cincinnati and St. Louis Railway.....	23.26	23.26	3.49	26.75
Crawford.....	New York, Pennsylvania and Ohio Railroad.....	5.90	5.90	6.88	12.78
	Cleve., Columbus, Cincinnati and Indianapolis R'y..	9.73	9.73	7.17	21.98
	Northwestern Ohio Railway.....	12.76	12.76	.41	13.17
	Pittsburgh, Fort Wayne and Chicago Railway.....	20.42	20.42	10.35	30.77
Cuyahoga ..	Ohio Central Railway.....	18.20	18.20	1.90	20.10
	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	16.05	16.05	35.46	64.57
	Cleveland and Pittsburgh Railroad.....	16.53	16.53	21.61	39.56
	Lake Shore and Michigan Southern Railway.....	31.32	31.32	47.66	111.11
	Rocky River Railroad.....	5.53	5.53	.36	5.89
	Cleveland and Mahoning Valley Railway. (a)				
	Cleveland, Painesville and Ashtabula Railroad.....	7.65	7.65	.50	8.15
	Chagrin Falls and Southern Railroad.....	4.75	4.75	.....	4.75
Darke .....	Valley Railway.....	19.02	19.02	5.59	24.61
	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	19.68	19.68	3.50	23.18
	Columbus, Chicago and Indiana Central Railroad.....	46.68	46.68	4.41	51.09
	Dayton and Union Railroad.....	26.28	26.28	1.51	27.79
	Toledo, Delphos and Burlington Railroad.....	9.18	9.18	.20	9.38
Defiance .....	Baltimore and Ohio and Chicago Railroad.....	30.35	30.35	4.06	34.41
	Wabash, St. Louis and Pacific Railway.....	14.24	14.24	7.47	21.71

TABLE IV.—RAILWAY MILEAGE IN COUNTIES—Continued.

Counties.	Company.	Single track.			Double track.	Sidings, etc.	Total rail.
		Main line.	Branches.	Total.			
Delaware....	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	33.10	.....	33.10	.....	6.50	39.60
	Cleveland, Mt. Vernon and Delaware Railroad.....	14.73	.....	14.73	.....	.72	15.45
	Ohio Central Railroad .....	1.70	.....	1.70	.....	1.80	.....
	Columbus and Toledo Railroad.....	22.21	.....	22.21	.....	2.33	24.54
	Cincinnati, Sandusky and Cleveland Railroad.....	8.20	.....	8.20	.....	2.54	10.74
Erie .....	Lake Shore and Michigan Southern Railway.....	28.74	.....	.....	.....	.....	52.97
	Lake Erie and Western Railway .....	7.20	3.72	32.46	.06	20.45	.....
	Sandusky, Mansfield and Newark Railroad.....	11.80	.....	7.20	.....	.30	7.50
Fairfield ....	Columbus and Muskingum Valley Railway.....	28.52	.....	11.80	.....	5.14	16.94
	Cincinnati and Hocking Valley Railroad.....	23.53	.....	28.52	.....	2.96	31.48
	Ohio Central Railroad .....	33.90	.....	23.53	.....	5.62	29.15
Fayette .....	Cincinnati and Muskingum Valley Railway.....	17.25	.....	33.90	.....	2.60	36.50
	Toledo, Delphos and Burlington Railroad .....	22.89	.....	17.25	.....	1.55	18.80
	Columbus, Washington and Cincinnati Railroad.....	3.20	.....	22.89	.....	1.07	23.96
Franklin ....	Ohio Southern Railroad.....	28.23	.....	3.20	.....	.03	3.23
	Central Ohio Railroad .....	12.17	.....	28.23	.....	.54	28.77
	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	11.73	.....	12.17	.....	7.37	19.54
Fulton .....	Cleveland, Mt. Vernon and Delaware Railroad.....	12.30	.....	11.73	.....	3.78	15.51
	Columbus, Chicago and Indiana Central Railway.....	13.52	.....	12.30	.....	.99	13.29
	Columbus and Hocking Valley Railroad .....	15.87	.....	13.52	.....	6.31	19.83
	Columbus, Springfield and Cincinnati Railroad.....	14.81	.....	15.87	.....	12.40	28.27
	Columbus and Toledo Railroad.....	12.21	.....	14.81	.....	1.50	16.31
Gallia .....	Columbus and Xenia Railroad .....	13.00	.....	12.21	.....	.87	13.08
	Pittsburgh, Cincinnati and St. Louis Railway.....	12.35	.....	13.00	.....	4.47	17.47
	Scioto Valley Railway .....	12.87	.....	12.35	.....	10.27	22.62
	Ohio Central Railroad .....	9.50	.....	12.87	.....	.84	13.71
	Chicago and Canada Southern Railway.....	4.66	.....	9.50	.....	.80	10.30
Fulton .....	Lake Shore and Michigan Southern Railway.....	.....	.....	4.66	.....	.28	4.94
	Wabash, St. Louis and Pacific Railway .....	.....	24.49	24.49	.....	5.72	30.21
	Ohio and West Virginia Railway.....	32	.....	.32	.....	.....	.32
Gallia .....	.....	30.91	.....	30.91	.....	1.72	32.63

Geauga.....	Painesville and Youngstown Railway .....	22.59	.....	22.59	.....	1.44	24.03
	Chagrin Falls and Southern Railroad .....	.75	.....	.75	.....	.....	.75
Greene.....	Cleveland and Mahoning valley Railway (a) .....	1.79	.....	1.79	.....	1.79	3.58
	New York, Pennsylvania and Ohio Railroad .....	4.89	.....	4.89	.....	.69	5.58
	Cincinnati and Springfield, leased from C., S. & C. ....	5.34	.....	5.34	.....	.71	6.05
	Columbus and Xenia Railroad .....	13.04	.....	13.04	.....	2.38	15.42
	Toledo, Delphos and Burlington Railroad .....	26.46	.....	26.46	.....	1.01	27.47
	Little Miami Railroad.....	20.78	11.23	32.01	.....	3.22	35.23
Guernsey ...	Columbus, Washington and Cincinnati Railway .....	5.50	.....	5.50	.....	.02	5.52
	Central Ohio Railroad .....	28.55	.....	28.55	.....	3.96	32.51
	Cleveland and Marietta Railroad.....	27.87	.....	27.87	.....	1.74	29.61
Hamilton.....	Eastern Ohio Railroad .....	7.75	.....	7.75	.....	.05	7.80
	Cincinnati and Eastern Railroad .....	10.80	3.03	13.83	.....	.77	14.60
	Cincinnati, Hamilton and Dayton Railroad .....	17.49	.....	17.49	10.85	12.12	40.46
	Cincinnati and Springfield Railroad .....	10.58	.....	10.58	.....	6.99	17.57
	Harrison Branch Railroad .....	7.01	.....	7.01	.....	.34	7.35
	Little Miami Railroad .....	16.93	.....	16.93	15.34	7.83	40.10
	Marietta and Cincinnati Railroad.....	17.70	.....	17.70	3.40	3.30	24.40
	Ohio and Mississippi Railway .....	19.52	.....	19.52	.....	10.40	29.92
	Cincinnati, Georgetown and Portsmouth Railway ..	10.40	.....	10.40	.....	.70	11.10
	Cincinnati and Baltimore Railroad .....	5.80	.....	5.80	.....	6.05	17.65
	Cincinnati and White Water Valley Railroad (b)....	2.10	.....	2.10	.....	.40	2.50
	Cincinnati, Indianapolis, St. Louis and Chicago R'y... College Hill Railroad.....	20.60	.....	20.60	2.00	13.63	36.23
	Cincinnati and Westwood Railroad .....	6.00	.....	6.00	.....	.22	6.22
	Cincinnati Southern Railway.....	5.63	.....	5.63	.....	.33	5.96
	Cincinnati Northern Railway .....	1.01	.....	1.01	.....	.....	1.01
Hancock .....	Cincinnati and Ohio and Chicago Railroad .....	11.00	.....	11.00	.....	.....	11.00
	Cincinnati, Sandusky and Cleveland Railroad .....	5.63	.....	5.63	.....	.53	6.16
	Lake Erie and Western Railway.....	11.22	11.22	11.22	.....	.....	11.22
Hardin.....	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	30.30	.....	30.30	.....	1.70	32.00
	Pittsburgh, Ft. Wayne and Chicago Railroad .....	9.29	.....	9.29	.....	1.70	10.99
	Cincinnati, Sandusky and Cleveland Railroad .....	20.23	.....	20.23	.....	3.67	23.90
Harrison .....	Pittsburgh, Cincinnati and St. Louis Railway .....	24.10	.....	24.10	.....	1.82	25.92
	Cleveland, Tuscarawas Valley and Wheeling R'y .....	24.24	7.80	32.04	.....	4.49	36.53
Henry .....	Baltimore and Ohio and Chicago Railroad .....	15.01	.....	15.01	.....	1.00	16.01
	Dayton and Michigan Railroad.....	18.51	.....	18.51	.....	3.19	21.70
	Wabash, St. Louis and Pacific Railway .....	5.16	.....	5.16	.....	.66	5.82
	Toledo, Delphos and Burlington Railroad .....	20.23	.....	20.23	.....	4.64	24.87
Highland.....	Marietta and Cincinnati Railroad.....	26.82	.....	26.82	.....	.89	27.71
	.....	17.70	10.30	28.30	.....	3.30	31.30

TABLE IV.—RAILWAY MILEAGE IN COUNTIES—Continued.

Counties.	Company.	Single track.			Double track.	Sidings, etc.	Total rail.
		Main line.	Branches.	Total.			
Highland .....	Ohio Southern Railroad.....	1.70	.....	1.70	.....	.22	1.92
Hocking.....	Columbus and Maysville Railway.....	17.10	.....	17.10	.....	.70	17.80
Holmes .....	Columbus and Hocking Valley Railroad.....	19.27	23.82	43.09	.....	14.31	57.40
Huron .....	Ohio and West Virginia Railway.....	12.69	.....	12.69	.....	.79	13.48
	Cleveland, Mt. Vernon and Delaware Railroad.....	29.12	.....	29.12	.....	4.95	34.07
	Pittsburgh, Ft. Wayne and Chicago Railway.....	7.15	.....	7.15	.....	.86	8.01
	Baltimore and Ohio and Chicago Railroad.....	5.79	.....	5.79	.....	4.03	9.82
	Cleve., Columbus, Cincinnati and Indianapolis R'y..	14.74	.....	14.74	.....	1.95	16.69
	Lake Shore and Michigan Southern Railway.....	26.63	.....	26.63	.....	11.57	38.20
Jackson .....	Sandusky, Mansfield and Newark Railroad.....	22.75	.....	22.75	.....	2.11	24.86
	Marietta and Cincinnati Railroad.....	8.90	29.50	38.40	.....	6.30	44.70
	Ohio Southern Railroad.....	16.05	.....	16.05	.....	3.79	19.84
Jefferson .....	Toledo, Delphos and Burlington Railroad.....	14.63	.....	14.63	.....	2.70	17.33
	Cleveland and Pittsburgh Railroad.....	39.38	.....	39.38	46	4.85	44.69
Knox .....	Pittsburgh, Cincinnati and St. Louis Railway.....	22.74	.....	22.74	.....	6.75	29.49
	Cleveland, Mt. Vernon and Delaware Railroad.....	35.93	.....	35.93	.....	5.76	41.69
	Sandusky, Mansfield and Newark Railroad.....	23.45	.....	23.45	.....	3.15	26.60
Lake .....	Ohio Central Railroad.....	4.80	.....	4.80	.....	.40	5.20
	Lake Shore and Michigan Southern Railway.....	28.50	.....	28.50	28.50	8.83	65.83
Lawrence .....	Painesville and Youngstown Railway.....	8.68	.....	8.68	.....	1.92	10.60
	Iron Railroad.....	12.75	5.25	18.00	.....	3.00	21.00
	Marietta and Cincinnati Railroad.....	.....	1.60	1.60	.....	.10	1.70
Licking .....	Scioto Valley Railway.....	11.00	.....	11.00	.....	.73	11.73
	Central Ohio Railroad.....	31.60	.....	31.60	.....	12.05	43.65
	Cleveland, Mt. Vernon and Delaware Railroad.....	.25	.....	.25	.....	.25	.50
	Newark, Somerset and Straitsville Railroad.....	10.55	.....	10.55	.....	1.50	12.05
	Pittsburgh, Cincinnati and St. Louis Railway.....	32.21	.....	32.21	.....	9.67	41.88
	Sandusky, Mansfield and Newark Railroad.....	14.30	.....	14.30	.....	3.15	17.45
Logan .....	Ohio Central Railroad.....	31.60	.....	31.60	.....	1.40	33.00
	Cleve., Columbus, Cincinnati and Indianapolis R'y..	30.06	.....	30.06	.....	5.69	35.75
	Cincinnati, Sandusky and Cleveland Railroad.....	21.50	.....	21.50	.....	1.34	22.84



Lorain .....	Cleve, Columbus, Cincinnati and Indianapolis R'y ..	27.73	.....	27.73	.....	7.20	34.93
	Cleveland, Tuscarawas Valley and Wheeling R'y ..	22.67	.....	22.67	.....	9.39	32.06
	Lake Shore and Michigan Southern Railway.....	34.97	.....	34.97	15.93	19.84	70.74
Lucas .....	Dayton and Michigan Railroad.....	2.22	.....	2.22	.....	3.14	5.36
	Toledo, Canada Southern and Detroit Railway ..	8.60	.....	8.60	.....	9.25	17.85
	Lake Shore and Michigan Southern Railway.....	13.99	23.81	37.80	4.09	50.86	92.75
Madison .....	Wabash, St. Louis and Pacific Railway .....	21.00	.....	21.00	.....	25.58	46.58
	North Western Ohio Railway .....	3.98	.....	3.98	.....	7.14	11.12
	Toledo, Ann Arbor and Grand Trunk Railway ..	5.00	.....	5.00	.....	2.60	5.00
Mahoning .....	Columbus and Toledo Railroad.....	2.40	.....	2.40	.....	.40	2.80
	Ohio Central Railroad .....	25.70	.....	25.70	.....	2.23	27.93
	Toledo, Delphos and Burlington Railroad.....	.12	.....	.12	.....	69	5.21
Marion .....	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	4.52	.....	4.52	.....	.50	15.56
	Columbus, Chicago and Indiana Central Railroad ..	15.06	.....	15.06	.....	2.11	21.15
	Columbus, Springfield and Cincinnati Railroad ..	19.04	.....	19.04	.....	.13	3.98
Miami .....	Columbus and Xenia Railroad .....	3.85	.....	3.85	.....	1.23	5.06
	Ohio Southern Railroad .....	3.83	.....	3.83	.....	.....	.....
	Ashtabula and Pittsburg Railroad.....	.....	.....	.....	.....	.....	.....
Medina .....	Cleveland and Mahoning Valley Railway. (a) ..	.90	.....	.90	.....	2.41	11.61
	Pittsburgh and Lake Erie Railroad .....	9.20	.....	9.20	.....	.....	4.52
	Alliance and Lake Erie Railroad .....	4.52	.....	4.52	.....	1.13	13.81
Mercer .....	Lawrence Railroad .....	8.62	4.06	12.68	.....	3.03	5.93
	Mahoning Coal Railroad.....	2.90	.....	2.90	.....	.68	4.11
	Painesville and Youngstown Railway.....	3.19	.24	3.43	.....	5.25	15.46
Miami .....	Pittsburgh, Ft. Wayne and Chicago Railway.....	10.21	.....	10.21	.....	20	4.40
	Ohio Central Railroad .....	4.20	.....	4.20	.....	2.29	27.53
	New York, Pennsylvania and Ohio Railroad .....	25.24	.....	25.24	.....	3.71	35.01
Meigs .....	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	31.30	.....	31.30	.....	2.85	22.38
	Columbus and Toledo Railroad.....	19.53	.....	19.53	.....	1.19	6.56
	Ohio and West Virginia Railway.....	5.37	.....	5.37	.....	2.10	10.54
Monroe .....	New York, Pennsylvania and Ohio Railroad .....	7.04	1.40	8.44	.....	3.41	21.22
	Cleveland, Tuscarawas Valley and Wheeling R'y ..	17.81	.....	17.81	.....	1.80	24.10
	Lake Erie and Western Railway .....	22.30	.....	22.30	.....	52	34.73
Monroe .....	Toledo, Delphos and Burlington Railroad.....	30.21	4.00	34.21	.....	10	2.80
	Dublin Township Railroad.....	2.70	.....	2.70	.....	6.92	28.98
	Columbus, Chicago and Indiana Central Railway ..	22.06	.....	22.06	.....	3.03	22.37
Monroe .....	Dayton and Michigan Railroad.....	19.34	.....	19.34	.....	.35	21.78
	Toledo, Delphos and Burlington Railroad.....	21.43	.....	21.43	.....	.....	.....
	Bellaire and Southwestern Railway.....	14.50	.....	14.50	.....	.....	.....

TABLE IV.—RAILWAY MILEAGE IN COUNTIES—Continued.

Counties.	Company.	Single track.			Double track.	Sidings, etc.	Total rail.
		Main line.	Branches.	Total.			
Montgomery	New York, Pennsylvania and Ohio Railroad .....	5.21	.....	5.21	.....	5.18	10.39
	Cincinnati, Hamilton and Dayton Railroad .....	14.59	.....	14.59	.....	4.56	19.15
	Cincin. and Springfield R'y—leased from C. S. & C. ....	5.20	.....	5.20	.....	7.00	12.20
	Cincinnati and Springfield Railroad .....	13.41	.....	13.41	.....	2.10	15.51
	Dayton and Michigan Railroad .....	11.40	.....	11.40	.....	2.92	14.32
	Dayton and Union Railroad .....	3.95	.....	3.95	.....	.04	3.99
	Little Miami Railroad .....	.....	5.50	5.50	.....	1.25	6.75
	Dayton and Western Railroad .....	17.00	.....	17.00	.....	1.74	18.74
	Toledo, Delphos and Burlington Railroad .....	23.50	.....	23.50	.....	1.46	24.96
	None .....	.....	.....	.....	.....	.....	.....
Morgan .....	New York, Pennsylvania and Ohio Railroad .....	2.30	.....	2.30	.....	.....	2.30
Morrow .....	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	24.72	.....	24.72	.....	1.71	26.43
Muskingum	Ohio Central Railroad .....	22.20	.....	22.20	.....	1.10	23.30
	Central Ohio Railroad .....	32.70	.....	32.70	.....	6.85	39.55
	Cincinnati and Muskingum Valley Railroad .....	26.61	.....	26.61	.....	3.62	30.23
	Pittsburgh, Cincinnati and St. Louis Railway .....	14.09	.....	14.09	.....	2.70	16.79
	Central Ohio Railroad .....	.45	.....	.45	.....	.....	.45
Noble .....	Cleveland and Marietta Railroad .....	21.07	.....	21.07	.....	1.16	22.23
	Lake Shore and Michigan Southern Railway .....	41.67	.....	41.67	3.97	16.12	61.76
Ottawa .....	North Western Ohio Railway .....	.55	.....	.55	.....	.....	.55
Paulding .....	Wabash, St. Louis and Pacific Railway .....	19.21	.....	19.21	.....	4.11	23.32
	Paulding and Cecil Railroad .....	6.40	.....	6.40	.....	.90	7.30
Perry .....	Cincinnati and Muskingum Valley Railroad .....	19.63	.....	19.63	.....	1.41	21.04
	Columbus and Hocking Valley Railroad .....	.....	1.89	1.89	.....	4.66	6.55
	Newark, Somerset and Straitsville Railroad .....	33.45	.....	33.45	.....	4.32	37.77
Pickaway .....	Ohio Central Railroad .....	12.40	.....	12.40	.....	6.20	18.60
	Cincinnati and Muskingum Valley Railroad .....	23.04	.....	23.04	.....	2.10	25.14
Pike .....	Scioto Valley Railway .....	23.47	.....	23.47	.....	1.16	24.63
	Scioto Valley Railway .....	19.35	.....	19.35	.....	.92	20.27
Portage .....	Ohio Southern Railroad .....	18.85	.....	18.85	.....	.40	19.25
	New York, Pennsylvania and Ohio Railroad .....	22.88	.....	22.88	.....	10.09	32.97

Portage .....	Cleveland and Pittsburgh Railroad .....	22.04	.....	22.04	.....	4.69	26.73
	Alliance and Lake Erie Railroad .....	11.59	.....	11.59	.....	.33	11.92
Preble .....	Cleveland and Mahoning Valley Railway. (a) .....	7.00	.....	7.00	.....	.04	7.04
	Connotton Valley Railway .....	23.52	.....	23.52	.....	1.63	25.15
	Cincinnati, Richmond and Chicago Railroad .....	5.69	.....	5.69	.....	.27	5.96
	Columbus, Chicago and Indiana Central Railway ..	1.51	.....	1.51	.....	.24	1.75
Putnam .....	Dayton and Union Railroad .....	19.50	.....	19.50	.....	1.01	20.51
	Dayton and Western Railroad .....	19.80	.....	19.80	.....	1.97	21.77
	Dayton and Michigan Railroad .....	23.30	.....	23.30	.....	1.09	24.39
Richland .....	Toledo, Delphos and Burlington Railroad .....	20.54	.....	20.54	.....	3.31	23.85
	New York, Pennsylvania and Ohio Railroad .....	15.78	.....	15.78	.....	4.45	20.23
	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	7.45	.....	7.45	.....	.36	7.81
	North Western Ohio Railway .....	24.15	.....	24.15	.....	5.47	29.62
	Pittsburgh, Ft. Wayne and Chicago Railroad .....	43.95	.....	43.95	.....	8.18	52.13
Ross .....	Sandusky, Mansfield and Newark Railroad .....	38.83	.....	38.83	.....	1.67	40.50
	Toledo, Delphos and Burlington Railroad .....	38.10	.....	38.10	.....	11.40	49.50
	Marietta and Cincinnati Railroad .....	24.86	.....	24.86	.....	.95	25.81
	Scioto Valley Railway .....	28.82	.....	28.82	.....	.72	29.54
	Ohio Southern Railroad .....	13.80	.....	13.80	.....	.47	14.27
Sandusky....	Cincinnati, Sandusky and Cleveland Railroad .....	27.20	.....	27.20	.....	2.20	29.40
	Lake Erie and Western Railway .....	26.66	.....	26.66	.....	8.12	34.78
	Lake Shore and Michigan Southern Railway .....	19.16	.....	19.16	.....	1.18	20.34
Scioto .....	North Western Ohio Railway .....	23.40	.....	23.40	.....	2.00	25.40
	Marietta and Cincinnati Railroad .....	31.55	.....	31.55	.....	1.82	33.37
Seneca .....	Scioto Valley Railway .....	31.46	.....	31.46	.....	3.46	34.92
	Baltimore and Ohio and Chicago Railroad .....	24.14	.....	24.14	.....	1.59	25.73
	Cincinnati, Sandusky and Cleveland Railroad .....	15.96	.....	15.96	.....	2.16	18.12
	Columbus and Toledo Railroad .....	10.20	.....	10.20	.....	.70	10.90
	Lake Erie and Western Railway .....	26.53	.....	26.53	.....	2.55	29.08
Shelby .....	North Western Ohio Railway .....	15.90	.....	15.90	.....	.90	16.80
	Ohio Central Railroad .....	23.05	.....	23.05	.....	3.00	26.05
	Cleve., Columbus, Cincinnati and Indianapolis R'y ..	20.49	.....	20.49	.....	3.44	23.93
Stark .....	Dayton and Michigan Railroad .....	11.24	.....	11.24	.....	.95	12.19
	Massillon and Cleveland Railroad .....	9.93	.....	9.93	.....	2.88	12.81
	Cleveland and Pittsburgh Railroad .....	24.49	.....	24.49	.....	11.75	36.24
	Cleveland, Tuscarawas Valley and Wheeling R'y ..	1.42	.....	1.42	.....	.35	1.77
	Alliance and Lake Erie Railroad .....	35.02	.....	35.02	.....	13.86	48.88
	Pittsburgh, Ft. Wayne and Chicago Railway .....	31.40	.....	31.40	.....	3.99	35.39
	Connotton Valley Railway .....	8.64	.....	8.64	.....	1.93	10.57
	Valley Railway .....		.....		.....		

TABLE IV.—RAILWAY MILEAGE IN COUNTIES—Continued.

Counties.	Company.	Single track.			Double track.	Sidings, etc.	Total rail.
		Main line.	Branches.	Total.			
Summit .....	New York, Pennsylvania and Ohio Railroad.....	19.34	.16	19.50	.....	6.87	26.37
	Cleveland, Mt. Vernon and Delaware Railroad.....	27.53	.....	27.53	.....	4.96	32.49
	Cleveland and Pittsburgh Railroad.....	12.06	.....	12.06	.....	2.10	14.16
	Cleveland, Tuscarawas Valley and Wheeling R'y.....	.92	.....	.92	.....	.35	1.27
	Massillon and Cleveland Railroad.....	.99	.....	.99	.....	.45	1.44
Trumbull.....	Valley Railway.....	31.04	.....	31.04	.....	5.29	36.33
	Ashabula and Pittsburgh Railway.....	29.71	.....	29.71	.....	1.77	31.48
	New York, Pennsylvania and Ohio Railroad.....	29.63	.....	29.63	.....	6.11	35.74
	Cleveland and Mahoning Valley Railway (a).....	19.04	20.74	39.78	.....	16.02	55.80
	Alliance and Lake Erie Railroad.....	7.47	.....	7.47	.....	.32	7.79
Tuscarawas ..	Mahoning Coal Railroad.....	27.56	5.09	32.65	.....	3.85	36.50
	Painesville and Youngstown Railway.....	27.34	.....	27.34	.....	1.07	28.41
	Cleveland and Pittsburgh Railroad.....	15.08	.....	15.08	.....	1.84	16.92
	Cleveland, Tuscarawas Valley and Wheeling R'y.....	30.94	.....	30.94	.....	8.08	39.02
	Cleveland and Marietta Railroad.....	22.80	.....	22.80	.....	2.40	25.20
Union.....	Pittsburgh, Cincinnati and St. Louis Railway.....	21.72	.....	21.72	.....	7.80	29.52
	New York, Pennsylvania and Ohio Railroad.....	23.91	.....	23.91	.....	4.53	28.44
	Clevé., Columbus, Cincinnati and Indianapolis R'y.....	17.87	.....	17.87	.....	1.92	19.79
	Columbus, Chicago and Indiana Central Railway.....	13.05	.....	13.05	.....	.97	14.02
	Pittsburgh, Ft. Wayne and Chicago Railway.....	25.58	.....	25.58	.....	4.22	29.80
Van Wert ...	Cincinnati, Van Wert and Michigan Railroad.....	10.38	.....	10.38	.....	.12	10.50
	Toledo, Delphos and Burlington Railroad.....	28.20	.....	28.20	.....	1.01	29.21
Vinton .....	Marietta and Cincinnati Railroad.....	25.60	.90	26.50	.....	5.90	32.40
	Toledo, Delphos and Burlington Railroad.....	4.30	.....	4.30	.....	.12	4.42
Warren .....	Ohio and West Virginia Railway.....	32.94	.....	32.94	.....	2.66	35.60
	Cincinnati, Hamilton and Dayton Railroad.....	3.72	.....	3.72	.....	.58	4.30
	Cincinnati and Muskingum Valley Railway.....	9.81	.....	9.81	.....	.57	10.38
	Cincinnati and Springfield Railway.....	4.32	.....	4.32	.....	1.24	5.56
	Cincinnati Northern Railway.....	12.10	.....	12.10	.....	.....	12.10
	Little Miami Railroad.....	32.27	.....	32.27	4.00	2.51	38.78

Warren .....	Marietta and Cincinnati Railroad.....	9.70	.....	9.70	.....	1.70	11.40
Washington.	Columbus, Washington and Cincinnati Railroad.....	2.58	.....	2.58	.....	.....	2.58
	Marietta and Cincinnati Railroad.....	.....	32.00	32.00	.....	.60	32.60
	Cleveland and Marietta Railroad.....	26.45	.....	26.45	.....	2.60	29.05
Wayne .....	Baltimore Short Line Railway.....	9.13	.....	9.13	.....	3.45	12.58
	New York, Pennsylvania and Ohio Railroad.....	18.95	.....	18.95	.....	2.89	21.84
	Cleveland, Mt. Vernon and Delaware Railroad.....	24.18	.....	24.18	.....	1.87	29.55
	Cleveland, Tuscarawas Valley and Wheeling R'y.....	12.75	3.50	12.75	.....	6.43	19.18
Williams .....	Pittsburgh, Ft. Wayne and Chicago Railway .....	30.87	.....	30.87	.....	6.32	37.19
Wood .....	Lake Shore and Michigan Southern Railway.....	.....	24.30	.....	.....	.....	.....
	Baltimore and Ohio and Chicago Railroad.....	18.57	.....	18.57	.....	4.23	28.53
	Columbus and Toledo Railroad.....	25.72	.....	25.72	.....	2.92	21.49
	Dayton and Michigan Railroad.....	32.08	.....	32.08	.....	3.21	28.93
	Lake Shore and Michigan Southern Railway .....	7.70	.....	7.70	7.24	3.53	35.61
	Bowling Green Railroad .....	5.50	.....	5.50	.....	1.78	16.72
	North Western Ohio Railway.....	9.55	.....	9.55	.....	.50	6.00
	Ohio Central Railroad.....	31.40	.....	31.40	.....	.96	10.51
Wyandot.....	Toledo, Delphos and Burlington Railroad.....	.75	.....	.75	.....	.70	32.10
	Cincinnati, Sandusky and Cleveland Railroad.....	14.82	4.29	19.11	.....	.44	1.19
	Columbus and Toledo Railroad.....	22.14	.....	22.14	.....	.74	19.85
	Pittsburgh, Ft. Wayne and Chicago Railway.....	20.23	.....	20.23	.....	2.49	24.63
	Ohio Central Railroad .....	9.20	.....	9.20	.....	4.18	24.41
Totals (c).....	.....	5,386.94	356.67	5,743.61	194.02	1,185.98	7,123.61
	.....	33.02	.....	33.02	.....	.....	33.02
	.....	(a) 5,353.92	.....	(a) 5,710.59	.....	.....	(a) 7,090.59

(a) The C. & M. Valley failed to report the mileage by counties. The length of the main line is 124.90 miles, all in Ohio. The side track is not reported. This, added to total given, makes 5,835.49 miles for the State.

(b) The Cincinnati and White Water Valley Railroad Co. has made no report since 1874.

(c) This total includes 33.02 miles of main track, between Newark and Columbus, owned jointly by the P., C. & St. L. and C. O. R. R. Cos.

TABLE V.—RAILWAY MILEAGE IN COUNTIES IN 1881.

Counties.	Main line.	Single track branches.	Total.	Double track.	Sidings, etc.	Total rail.
Adams.....	1.53	.....	1.53	.....	.30	1.83
Allen.....	81.07	.....	81.07	.....	14.62	95.69
Ashland.....	29.04	.....	29.04	.....	4.71	33.75
Ashtabula.....	56.84	40.98	97.82	27.78	25.10	150.70
Athens.....	54.45	17.42	71.87	.....	19.92	91.79
Auglaize.....	28.62	9.20	37.82	.....	3.26	41.08
Belmont.....	113.83	.....	113.83	.....	16.70	130.53
Brown.....	21.79	.....	21.79	.....	.68	22.47
Butler.....	76.50	.....	76.50	5.12	13.19	94.81
Carroll.....	33.29	.....	33.29	.....	3.33	36.62
Champaign.....	78.10	.....	78.10	.....	13.23	91.33
Clarke.....	98.54	.....	98.54	.....	13.28	111.82
Clermont.....	50.33	11.47	61.80	6.15	2.79	70.74
Clinton.....	52.87	11.10	63.97	.....	5.74	69.71
Columbiana <sup>1</sup> .....	68.60	.....	68.60	1.64	20.14	90.38
Coshocton.....	23.26	.....	23.26	.....	3.49	26.75
Crawford.....	67.01	.....	67.01	5.08	26.71	98.80
Cuyahoga <sup>1</sup> .....	100.85	.....	100.85	46.61	111.18	258.64
Darke.....	101.82	.....	101.82	.....	9.62	111.44
Defiance.....	44.59	.....	44.59	.....	11.53	56.12
Delaware.....	71.74	.....	71.74	.....	9.65	81.39
Erie.....	55.94	3.72	59.66	.06	28.43	88.15
Fairfield.....	85.95	.....	85.95	.....	11.18	97.13
Fayette.....	71.57	.....	71.57	.....	3.19	74.76
Franklin.....	140.33	.....	140.33	.....	49.60	189.93
Fulton.....	4.98	24.49	29.47	.....	6.00	35.47
Gallia.....	30.91	.....	30.91	.....	1.72	32.63
Geauga.....	25.13	.....	25.13	.....	3.23	28.36
Greene.....	76.01	11.23	87.24	.....	8.03	95.27
Guernsey.....	64.17	.....	64.17	.....	5.75	69.92
Hamilton.....	162.57	3.03	165.60	37.39	63.08	266.07
Hancock.....	35.93	11.22	47.15	.....	2.23	49.38
Hardin.....	53.62	.....	53.62	.....	7.19	60.81
Harrison.....	39.25	7.80	47.05	.....	5.49	52.54
Henry.....	70.72	.....	70.72	.....	9.38	80.10
Highland.....	36.50	10.30	46.80	.....	4.22	51.02
Hocking.....	31.96	23.82	55.78	.....	15.10	70.88
Holmes.....	36.27	.....	36.27	.....	5.81	42.08
Huron.....	69.91	.....	69.91	.....	19.66	89.57
Jackson.....	39.58	29.50	69.08	.....	12.79	81.87
Jefferson.....	62.12	.....	62.12	.46	11.60	74.18
Knox.....	64.18	.....	64.18	.....	9.31	73.49
Lake.....	37.18	.....	37.18	28.50	10.75	76.48
Lawrence.....	23.75	6.85	30.60	.....	3.83	34.43
Licking.....	120.51	.....	120.51	.....	27.77	148.28
Logan.....	51.56	.....	51.56	.....	7.03	58.59
Lorain.....	85.37	.....	85.37	15.93	36.43	137.73
Lucas.....	82.89	23.81	106.70	4.09	97.22	208.01
Madison.....	42.59	.....	42.59	.....	3.43	46.02
Mahoning <sup>1</sup> .....	47.57	4.30	51.87	.....	13.93	65.80



TABLE V.—RAILWAY MILEAGE IN COUNTIES—Continued.

Counties.	Main line.	Single track branches.	Total.	Double track.	Sidings, etc.	Total rail.
Marion.....	76.07	.....	76.07	.....	8.85	84.92
Medina .....	24.85	1.40	26.25	.....	5.51	31.76
Meigs .....	5.37	.....	5.37	.....	1.19	6.56
Mercer .....	55.21	4.00	59.21	.....	3.12	62.33
Miami.....	62.83	.....	62.83	.....	10.30	73.13
Monroe .....	14.50	.....	14.50	.....	.25	14.75
Montgomery .....	94.26	5.50	99.76	.....	26.25	126.01
Morgan .....	None.	.....	.....	.....	.....	.....
Morrow .....	49.22	.....	49.22	.....	2.81	52.03
Muskingum .....	73.40	.....	73.40	.....	13.17	86.57
Noble .....	21.52	.....	21.52	.....	1.16	22.68
Ottawa.....	42.22	.....	42.22	3.97	16.12	62.31
Paulding .....	25.61	.....	25.61	.....	5.01	30.62
Perry .....	65.48	1.89	67.37	.....	16.59	83.96
Pickaway .....	46.51	.....	46.51	.....	3.26	49.77
Pike .....	38.20	.....	38.20	.....	1.32	39.52
Portage <sup>1</sup> .....	63.51	.....	63.51	.....	15.15	78.66
Preble .....	50.22	.....	50.22	.....	3.15	53.37
Putnam .....	43.10	.....	43.10	.....	3.06	46.16
Richland .....	111.87	.....	111.87	.....	21.77	133.64
Ross .....	130.61	.....	130.61	.....	14.74	145.35
Sandusky .....	86.82	.....	86.82	.....	1.97	98.79
Scioto .....	31.55	23.40	54.95	.....	3.82	58.77
Seneca .....	124.19	.....	124.19	.....	11.36	135.55
Shelby .....	43.54	.....	43.54	.....	6.44	49.98
Stark .....	122.14	.....	122.14	.....	35.71	157.85
Summit.....	91.88	.16	92.04	.....	20.02	112.06
Trumbull <sup>1</sup> .....	121.71	5.09	126.80	.....	13.12	139.92
Tuscarawas .....	90.54	.....	90.54	.....	20.12	110.66
Union.....	54.83	.....	54.83	.....	7.42	62.25
Van Wert .....	64.16	.....	64.16	.....	5.35	69.51
Vinton .....	62.84	.90	63.74	.....	8.68	72.42
Warren .....	74.50	.....	74.50	4.00	6.60	85.10
Washington .....	35.58	32.00	67.58	.....	6.65	74.23
Wayne.....	86.75	3.50	90.25	.....	17.51	107.76
Williams .....	.....	24.30	24.30	.....	4.23	28.53
Wood .....	131.27	.....	131.27	7.24	14.04	152.55
Wyandot .....	66.39	4.29	70.68	.....	7.61	78.29
Totals .....	(a) 5386.94	356.67	(a) 5743.61	194.02	1185.98	(a) 7123.61

<sup>1</sup> The Cleveland and Mahoning Valley Railway passes through these counties, but the company failed to report the mileage in these counties. The road has 124.90 miles of single track in Ohio, according to the report. The sidings are not reported.

(a) This total includes 33.02 miles between Newark and Columbus, owned jointly by the P. C. & St. L. and Central Ohio R. R. Co.'s. These 33.02 miles have been twice counted.



Chicago and Canada Southern.....	4,600	4,500	.....	.....	.....	1,667	1,630 00	56,450 00
Chagrin Falls and Southern.....	5,000	2,350	.....	.....	.....	.....	.....	11,750 00
Cleveland, Columbus, Cincinnati and Indianapolis .....	365,971	14,000	18,140	6,000	.....	3,500	4,000 00	6,158,216 00
“ and Marietta.....	98,190	2,000	.....	.....	.....	800	.....	246,872 00
“ and Mahoning Valley.....	123,797	12,000	.....	.....	.....	3,000	2,960 00	.....
“ “ Hubbard Branch.....	.....	5,000	.....	.....	.....	2,500	.....	1,831,930 00
“ “ Liberty and Vienna Branch.....	.....	3,500	.....	.....	.....	2,500	.....	.....
“ “ Niles and N.L. Branch.....	.....	3,400	.....	.....	.....	1,700	.....	.....
“ “ Mt. Vernon and Columbus .....	143,850	5,000	.....	.....	.....	2,000	.....	894,236 00
“ “ Painesville and Ashtabula.....	7	1,000	.....	.....	.....	.....	850 00	9,000 00
“ “ and Pittsburgh.....	182,730	17,000	3,520	10,000	.....	4,000	6,500 00	4,997,147 00
“ “ Tuscarawas Valley and Wheeling.....	157,500	5,000	.....	.....	.....	1,800	1,575 00	1,135,212 00
Columbus and Maysville.....	17,420	1,400	.....	.....	.....	600	148 68	27,248 00
“ “ and Hocking Valley.....	75,620	12,000	.....	.....	.....	25,980	3,000	6,306 86
“ “ Straitsville Branch.....	12,390	7,500	.....	.....	.....	8,260	2,000	3,855 93
“ “ Monday Creek Branch.....	16,830	3,500	.....	.....	.....	8,140	2,000	.....
“ “ Snow Fork Branch.....	3,610	3,500	.....	.....	.....	2,980	.....	1,793,461 00
“ “ and Toledo.....	117,770	8,000	.....	.....	.....	16,510	2,500	1,403,200 00
“ “ Washington and Cincinnati.....	23,330	800	.....	.....	.....	.....	2,930 00	27,164 00
Crafts Iron Company.....	.....	.....	.....	.....	.....	.....	.....	3,192 00
Connotton Valley.....	61,300	2,500	.....	.....	.....	2,980	.....	250,625 00
Dayton and Michigan.....	140,714	11,000	.....	.....	.....	23,647	2,131 98	2,127,249 00
“ “ and Union.....	31,693	5,000	.....	.....	.....	1,792	1,554 00	213,766 56
“ “ and Southeastern .....	107,137	2,500	17,513	.....	.....	8,026	709 00	373,335 00
Detroit, Butler and St. Louis .....	28,850	6,000	.....	.....	.....	1,000	.....	174,600 00
Eastern Ohio.....	7,750	900	.....	.....	.....	100	.....	9,115 00
Harrison Branch.....	7,010	2,000	.....	.....	.....	340	.....	14,360 00
Hayden's Switch.....	3,000	2,000	.....	.....	.....	1,125	.....	36,550 00
Hazleton and Leetonia.....	2,500	1,000	.....	.....	.....	.....	.....	4,100 00
Indiana, Bloomington and Western—Ohio Division, .....	.....	.....	.....	.....	.....	.....	.....	.....
Springfield to Sandusky.....	129,420	8,000	.....	.....	.....	12,390	1,500 00	1,485,426 00
Indiana, Bloomington and Western—Ohio Division, .....	.....	.....	.....	.....	.....	.....	.....	.....
Findlay Branch.....	15,510	3,500	.....	.....	.....	.....	.....	.....
Indiana, Bloomington and Western—Ohio Division, .....	.....	.....	.....	.....	.....	.....	.....	.....
Springfield to Columbus .....	44,370	7,500	.....	.....	.....	2,250	1,300 00	403,237 00
Iron .....	18,460	6,500	.....	.....	.....	3,300	2,402 00	178,645 00
Lake Erie and Western .....	146,630	6,500	.....	.....	.....	13,080	1,200 00	1,257,423 00
Lake Shore and Michigan Southern .....	376,986	25,000	118,428	10,000	.....	210,045	8,000 00	15,356,308 00
Lawrence .....	8,609	7,500	.....	.....	.....	5,185	3,070 00	113,602 00

TABLE VI.—MILEAGE AND VALUATIONS OF RAILROADS IN OHIO, ETC.—Continued.

Names of Railroads.	Number of miles of main track.	Valuation per mile, main track.	Number of miles of second track.	Valuation per mile, second track.	Number of miles of side track.	Valuation per mile, side track.	Valuation per stock, rolling	Total valuation.
Little Miami, Cincinnati and Indiana .....	2,490	\$3,000	.....	.....	.....	.....	.....	\$7,470 00
Longstreth's Switch .....	.....	.....	.....	.....	.....	.....	.....	10,777 00
Massillon and Cleveland .....	12,230	4,000	.....	.....	1,400	\$1,800	\$950 35	64,161 00
Mahoning Coal .....	38,300	6,500	.....	.....	13,500	300	2,700 00	363,355 00
Marietta and Cincinnati .....	183,680	8,500	2 500	\$12,000	71,350	2,000	1,431 00	2,807,366 00
“ Hillsboro Branch .....	21,44	5,000	8 700	10,000	.....	1,500	.....	
“ Portsmouth Branch .....	55,43	5,000	.....	.....	.....	1,500	.....	
“ Old Line Branch .....	31,21	1,000	.....	.....	.....	1,500	.....	
Marietta Division .....	11,09	5,000	.....	.....	.....	.....	.....	38,770 00
Mt. Adams and Eden Park .....	2,000	4,500	.....	.....	.....	1,200	.....	10,012 00
Mt. Gilead Short Line .....	.....	.....	.....	.....	260	.....	.....	19,652 00
McComb, Deshler and Toledo .....	8,750	2,000	.....	.....	190	800	250 00	3,713,646 00
New York, Pennsylvania and Ohio .....	246,270	9,000	.....	.....	58,368	2,500	2,923 67	907,399 00
Northwestern Ohio .....	79,983	9,000	.....	.....	8,619	3,000	1,500 00	1,361,253 00
Ohio Central .....	197,380	4,000	.....	.....	16,850	1,000	2,640 00	271,131 00
Ohio and Mississippi .....	19,520	11,000	.....	.....	10,400	2,500	975 00	451,870 00
Ohio and West Virginia .....	81,910	4,000	.....	.....	6,360	2,000	1,230 00	483,410 00
Ohio Southern .....	113,454	2,900	.....	.....	9,735	1,100	1,100 00	205,666 00
Painesville and Youngstown .....	61,800	2,701	.....	.....	6,390	504	540 00	28,250 00
Paulding and Cecil .....	6,400	900	.....	.....	.....	.....	.....	3,016,068 00
Pittsburgh, Cincinnati and St. Louis—Columbus and Pittsburgh Division .....	117,580	12,500	.....	.....	31,250	3,000	5,860 00	
Pittsburgh, Cincinnati and St. Louis—Columbus and Pittsburgh Division, Cadiz Branch .....	8,100	4,000	.....	.....	.....	.....	.....	
Pittsburgh, Cincinnati and St. Louis—Columbus and Pittsburgh Division, Newark to Columbus .....	33,030	7,000	.....	.....	17,900	1,750	.....	

	119,350	14,000	25,490	5,000	23,630	3,000	1,820 00	2,898,377 00
Pittsburgh, Cincinnati and St. Louis—Little Miami Division.....	119,350	14,000	25,490	5,000	23,630	3,000	1,820 00	2,898,377 00
Pittsburgh, Cincinnati and St. Louis—Little Miami Division, Springfield Branch.....	19,370	6,500			2,440	2,300		
Pittsburgh, Cincinnati and St. Louis—Little Miami Division, Richmond Branch.....	53,230	7,000			5,300	2,500		
Pittsburgh, Cincinnati and St. Louis—Columbus, Chicago and Indiana Central.....	135,880	13,500			28,230	3,000	1,710 00	2,275,489 00
Pittsburgh, Cincinnati and St. Louis—Cincinnati and Muskingum Valley Division.....	148,450	9,000			13,710	2,500	800 00	1,075,088 00
Pittsburgh, Fort Wayne and Chicago.....	251,856	30,000			70,061	5,000	5,800 00	9,696,845 00
" and Lake Erie.....	8,100	7,500			1,320	3,000	4,511 00	102,580 00
Price's Inclined Plane.....								32,830 00
Rocky River.....	5,600	2,000					850 00	15,675 00
Salineville.....	3,000	2,600					333 33	9,000 00
Scioto Valley.....	122,370	6,000			5,500	2,000	1,400 00	948,488 00
St. Clairsville Narrow Gauge.....	3,400	1,000					1,006 00	6,870 00
Sommers' Switch.....								1,867 00
Thomas' Iron Works.....								1,740 00
Toledo, Canada Southern and Detroit.....	8,600	6,000			4,960	2,500	2,745 00	87,605 00
" Delphos and Burlington.....	201,180	1,800			9,460	800	567 55	495,059 00
" Ann Arbor and Grand Trunk.....	5,000	5,000			.060	5,000	771 77	27,427 18
Valley.....	58,700	6,000			12,810	2,000		485,955 00
Van Wert, Celina and State Line.....	13,000	820			.180	300		15,266 00
Wabash, St. Louis and Pacific.....	75,000	9,500			41,800	3,000	3,200 00	1,212,404 00
Youngstown.....	650	2,000						1,300 00
" and Austintown.....	3,100	2,000						6,200 00
Pullman Palace Cars—C. H. and D.....								3,560 00
" L. M.....								25,004 00
" W., St. L. and P.....								6,000 00
" D. and M.....								12,000 00
New York Central Sleeping Car Co.....								206,360 00
	5,892,343		160,631		775,313			\$88,764,315 74

<sup>1</sup> Third rail.

<sup>2</sup> Triple track.

<sup>3</sup> Double track.

TABLE VII.—VALUE OF RAILROAD PROPERTY IN EACH COUNTY, AND TAXES LEVIED THEREON, FOR THE YEAR 1881, AS REPORTED BY COUNTY AUDITORS.

Counties.	Realty.	Personalty.	Total valuation.	Taxes for 1881.
Adams.....		\$4,007	\$4,007	\$85 77
Allen.....	\$6,220	1,583,148	1,589,368	31,839 41
Ashland.....	976	588,930	589,906	7,019 61
Ashtabula.....		2,055,446	2,055,446	25,898 89
Athens.....	22,535	791,728	814,263	16,299 04
Auglaize.....	2,450	382,965	385,415	6,779 00
Belmont.....	70,790	1,023,060	1,093,850	12,347 62
Brown.....	44,848	6,427	50,775	834 28
Butler.....	10,360	1,143,902	1,154,262	12,950 97
Carroll.....		384,720	384,720	3,814 59
Champaign.....	10,790	1,153,474	1,164,264	12,900 65
Clarke.....	29,250	1,180,724	1,209,974	14,063 80
Clermont.....	241,490	31,807	273,297	4,114 73
Clinton.....	4,322	489,055	443,377	6,232 20
Columbiana.....	2,143,200	127,699	2,270,899	25,854 07
Coshocton.....	1,460	457,110	458,570	5,532 51
Crawford.....		1,546,810	1,546,810	22,272 23
Cuyahoga.....	257,025	2,924,143	3,181,168	81,843 33
Darke.....	28,350	1,326,730	1,355,080	17,441 21
Defiance.....		579,958	579,958	12,337 87
Delaware.....	930	1,005,129	1,006,059	7,697 38
Erie <sup>1</sup> .....			1,749,583	37,678 90
Fairfield.....	6,040	901,640	907,680	10,657 54
Fayette.....	2,360	321,233	323,593	3,899 54
Franklin.....	259,530	1,991,510	2,251,040	26,264 45
Fulton.....		962,789	962,789	14,316 19
Gallia.....	129,930	38,950	168,880	2,330 35
Geauga.....	1,540	106,722	108,262	1,213 04
Greene.....	20,391	804,804	825,195	9,853 33
Guernsey.....		466,508	466,508	5,696 12
Hamilton.....	213 360	2,079,084	2,292,444	36,812 19
Hancock.....	4,000	382,201	386,201	6,322 12
Hardin.....	19,975	1,140,705	1,160,680	23,173 70
Harrison.....	5,610	618,690	624,300	6,325 66
Henry.....	508,485	129,772	638,257	16,016 97
Highland.....	2,500	283,840	286,340	3,296 33
Hocking.....	1,424	694,917	696,341	10,943 16
Holmes.....	5,130	435,557	440,687	6,848 29
Huron <sup>1</sup> .....			1,775,201	26,595 12
Jackson.....	1,079	412,911	413,990	8,114 88
Jefferson.....	997,450	475,120	1,472,570	16,155 75
Knox.....		5,491 <sup>1</sup>	5,491	6,694 20
Lake.....	5,220	1,413,445	1,418,665	15,860 63
Lawrence.....	8,060	280,048	288,108	5,523 38
Licking.....	1,267	1,476,405	1,477,672	19,838 98
Logan.....	4,800	783,090	787,890	10,056 70
Lorain.....	1,727,131	490,718	2,217,849	29,582 46
Lucas.....		2,825,390	2,825,390	56,325 12
Madison.....	6,010	537,337	543,347	6,159 95
Mahoning <sup>1</sup> .....			976,550	15,571 66



TABLE VII.—Continued.

Counties.	Realty.	Personalty.	Total valuation.	Taxes for 1881.
Marion .....	\$12,790	\$917,378	\$930,168	\$12,125 06
Medina .....	172,184	57,066	229,250	2,154 74
Meigs .....	12,628	32,370	44,998	887 84
Mercer <sup>1</sup> .....			267,640	4,851 18
Miami .....	26,863	692,533	719,396	9,929 86
Monroe .....	22,050	3,065	25,115	470 30
Montgomery .....	34,860	1,169,380	1,204,240	18,769 46
Morgan <sup>2</sup> .....				
Morrow .....	637	651,140	651,777	7,543 79
Muskingum .....	6,810	943,843	950,653	11,644 00
Noble .....		58,187	58,187	929 02
Ottawa .....	3,980	1,645,989	1,649,969	25,363 84
Paulding <sup>1</sup> .....			294,813	7,529 68
Perry .....		556,206	556,206	7,801 68
Pickaway .....	6,850	345,169	352,019	4,323 06
Pike .....		222,295	222,295	3,302 33
Portage .....	3,890	1,493,761	1,497,651	20,177 88
Preble .....	408,742	84,686	493,428	5,644 41
Putnam .....		333,230	333,230	8,388 70
Richland .....	8,510	2,143,010	2,151,520	23,327 84
Ross .....	26,750	849,524	876,274	11,606 46
Sandusky .....	4,740	1,578,246	1,582,986	23,710 75
Scioto .....	309,250	104,095	413,345	7,474 48
Seneca .....	1,040,972	243,926	1,284,898	14,830 89
Shelby .....	560	720,800	721,360	11,674 24
Stark <sup>1</sup> .....			2,049,181	27,700 00
Summit .....	779,485	252,140	1,031,625	13,576 49
Trumbull <sup>1</sup> .....			1,589,280	22,395 76
Tuscarawas .....	15,770	1,181,591	1,197,361	18,342 09
Union .....	830,293	35,250	865,543	13,712 15
Van Wert .....	859,538	176,261	1,035,799	21,865 74
Vinton .....		477,312	477,312	8,920 36
Warren .....	7,699	909,956	917,655	7,574 42
Washington .....	47,660	287,237	334,897	5,023 72
Wayne .....	1,010	1,665,710	1,666,720	17,675 89
Williams <sup>1</sup> .....			1,061,608	17,491 54
Wood .....		1,627,220	1,627,220	22,252 46
Wyandot <sup>1</sup> .....			1,245,190	16,433 30
Totals .....	\$11,450,309	\$60,254,425	\$82,713,780	\$1,223,711 28

<sup>1</sup> Counties marked <sup>1</sup> report only the total value of railroad property.<sup>2</sup> Morgan county reports: "No railroads."

TABLE VIII.—CAPITAL STOCK.

Name and how operated.	Amount author- ized.	Amount paid in.		Per mile.		Proportion for Ohio.	
		Miles.	Amounts.	Miles.	Amounts.	Miles.	Amounts.
Alliance and Lake Erie R. R.—Company	\$450,000 00		\$100,000 00	25.00	\$4,000 00	25.00	\$100,000 00
Baltimore and Ohio R. R. Co.—							
Baltimore and Ohio R. R. (stock ownership)	12,000,000 00		1,503,450 00	262.60	5,725 24	110.31	631,531 25
Central Ohio R. R. (under lease)	3,000,000 00		2,838,850 00	137.29	20,823 45	137.29	2,838,850 00
Newark, Somerset and Straitsville R. R. (under lease)	1,063,000 00		1,073,000 00	44.00	23,056 50	41.00	1,013,000 00
Sandusky, Mansfield and Newark R. R. (under lease)	1,110,000 00		1,073,504 00	116.25	9,274 44	116.25	1,073,504 00
Bellare and Southwestern R'y—Company	500,000 00		167,498 85	42.00	3,985 06	42.00	167,498 85
Bowling Green R. R.—Lessee. None to report							(a)
Ceding, Van Wert and State Line R'y—Company (till March 5; sold then to C., V. W. & M. R. Co.)	(g)	100,000 00	(g)	10.50	1,014 28	(g)	10,650 00
Chagrin Falls and Southern R. R.—Company (from February 1, 1881)	40,000 00		27,050 00	5.00	5,410 00	5.00	27,050 00
Cincinnati and Eastern R'y—Company	500,000 00		242,427 46	68.00	3,682 75	68.00	242,427 46
Cincinnati, Georgetown and Portsmouth R. R.—Company (from Sept. 13, 1880)	3,300,000 00		113,450 00	28.00	4,050 00	28.00	113,450 00
Cincinnati, Hamilton and Dayton R. R.—Company	3,500,000 00		3,500,000 00	60.00	58,333 33	60.00	3,500,000 00
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership)	2,775,765 90		2,775,765 90	98.20	28,307 20	19.50	551,990 40
Cincinnati, Richmond and Chicago R. R. (lease)	382,600 00		382,600 00	35.55	10,623 06	35.55	382,600 00
Dayton and Michigan R. R. (lease)	6,200,000 00		3,614,072 30	140.71	25,684 54	140.71	3,614,072 30
Cincinnati, Indianapolis, St. Louis and Chicago R'y—Company	4,000,000 00		4,000,000 00	179.03	22,342 62	22.06	49,788 20
Harrison Branch R. R. (under lease)	200,000 00		200,000 00	7.75	25,805 45	7.01	180,963 51
Harrison Northern R'y—Company	1,000,000 00		(a)	(a)	(a)	(a)	(a)
Cincinnati Northern R'y—Company	500,000 00		(g)	20.00	4,741 74	(g)	94,835 82
Cincinnati and Portsmouth R. R.—Receiver (till Sept. 13; sold to C., G. & P. R. Co.)	5,000,000 00		1,752,550 00	356.00	5,218 90	1.016	5,297 18
Cincinnati Southern R'y (under lease)							
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to L., B. & W.)	6,475,000 00		4,434,787 45	169.76	26,133 87	169.76	4,434,787 45
Cincinnati, Springfield and Cincinnati R. R. (till May 1; leased to L., B. & W.)	2,000,000 00		1,000,000 00	44.37	22,537 75	44.37	1,000,000 00
Cincinnati, Van Wert and Michigan R. R. by C., V. W. & M. C. Co., from March 5; construction contract	2,000,000 00		(a)	(a)	(a)	(a)	(a)
Cincinnati and Westwood R. R.—Company	100,000 00		63,500 00	5.63	11,661 07	5.63	63,500 00
Cleveland, Columbus, Cincinnati and Indianapolis R'y—Company	15,000,000 00		14,391,700 00	391.15	38,527 49	306.60	11,751,208 43
Cincinnati and Springfield R'y (under lease)	5,000,000 00		1,100,000 00	48.05	22,892 82	48.05	1,100,000 00
Cleveland and Marietta R. R.—Company	4,000,000 00		1,218,000 00	98.17	12,407 00	98.17	1,218,000 00
Cleveland, Mt. Vernon and Delaware R. R.—Receiver	5,500,000 00		1,769,880 45	144.04	12,287 42	144.04	1,769,880 45
Cleveland, Painesville and Ashtabula R. R. Company. (Not reported)							
Cleveland, Tuscarawas Valley and Wheeling R'y—Company	7,180,000 00		1,205,950 00	158.50	7,608 52	158.50	1,205,950 00
College Hill R. R.—Company (from May 1, 1881)	300,000 00		97,000 00	6.00	16,166 67	6.00	97,000 00
Columbus and Hocking Valley R. R.—Company	2,500,000 00		2,500,000 00	112.00	22,321 43	112.00	2,500,000 00
Columbus & Maysville R. R.—Company	350,000 00		60,400 00	18.70	3,290 00	18.70	60,400 00
Columbus and Toledo R. R.—Company	2,500,000 00		1,039,500 00	117.70	8,831 77	117.70	1,039,500 00
Columbus, Washington and Cincinnati R. R.—E. L. Harper et al.	200,000 00		67,300 00	23.39	2,884 00	23.39	67,300 00
Conotton Valley R'y—Company	3,000,000 00		(a)	(a)	(a)	(a)	3,000,000 00
Dayton and Southeastern R. R.—Receiver (till May 21; then consolidated with T., D. & B. R.)	(g)	1,000,000 00	(g)	115.00	4,286 41	(g)	492,937 47
Dayton and Union R. R.—Trustee	86,300 00		86,300 00	31.74	2,718 99	31.74	86,300 00

Eastern Ohio R. R.—W. H. & C. B. Stevens. None				Indiana, Bloomington and Western R'y Co—				Cincinnati, Sandusky and Cleveland R. R. } Ohio Division (from May 1)				Columbus, Springfield and Cincinnati R. R. } (See C. S. & C.)			
Iron Railroad—Company				Lake Erie and Western R'y Company				Lake Shore and Michigan Southern R'y—Company				Chi. and Canada Southern R'y (by stock ownership and special agreement)			
Mahoning Coal R. R. (under lease)				Marquette and Cincinnati R. R.—Receiver				Baltimore, Short Line R'y (special agreement)				Cincinnati and Baltimore R'y (special agreement)			
New York, Pennsylvania and Ohio R. R.—Company				Cleveland and Mahoning Valley R'y (under lease)				Ohio Central R. R.—Company				Ohio and Mississippi R'y—Receiver			
Ohio and West Virginia R'y—Company				Painesville, Canton and Bridgeport N. G. R.—Company and Receiver (til February 1; sold to C. F. & S.)				Painesville and Youngstown R'y—Company				Paulding and Cecil R'y—Company			
Pennsylvania Company—				Astabula and Pittsburgh R'y (under lease)				Cleveland and Pittsburgh R. R. (under lease)				Lawrence R. R. (under lease)			
Massillon and Cleveland R. R. (under lease)				North Western Ohio R'y (under lease)				Pittsburgh, Ft. Wayne and Chicago R'y (under lease)				Cincinnati and Muskingum Valley R'y (under lease)			
Columbus, Chicago and Indiana Central R'y (under lease)				Little Miami R'y (under lease)				Rocky River R. R.—Company				Sodoto Valley R. R.—Company			
Springfield Southern R. R.—Company				St. Clairsville and Northern R'y—Company				St. Clairsville and Northern R'y—Company				St. Clairsville and Northern R'y—Company			
Toledo, Ann Arbor and Grand Trunk R'y—Company (from October 1)				Toledo, Delphos and Burlington R. R.—Company				Valley Railway—Company				Wabash, St. Louis and Pacific R'y—Company			
Totals				Totals				Totals				Totals			
500,000 00				399,700 00				18 00				22,205 55			
7,700,000 00				7,700,000 00				280,553				19,526 93			
50,000,000 00				50,000,000 00				1,071 84				48,794 10			
10,000,000 00				2,607,400 00				67 60				30,458 83			
1,000,000 00				1,373,000 00				43 40				31,635 94			
(b) 14,000,000 00				(b) 275,500 00				(b) 275,500 00				(b) 275,500 00			
1,250,000 00				1,244,400 00				30 53				50,743 02			
1,250,000 00				1,237,465 00				6 80				41,011 65			
45,000,000 00				44,999,350 00				423 34				213,078 45			
2,750,000 00				2,750,000 00				123 35				106,321 12			
12,000,000 00				12,000,000 00				217 40				22,368 87			
25,000,000 00				25,000,000 00				393 00				63,145 70			
(g) 2,500,000 00				(g) 750,000 00				82 00				61,145 00			
1,000,000 00				(a) 260,575 00				61 80				(a) 4,216 42			
2,200,000 00				13,250 00				6 40				2,070 31			
25,000 00				1,658,491 88				62 00				26,401 78			
1,700,000 00				11,214,336 31				197 65				50,887 26			
500,000 00				450,000 00				22 04				20,417 42			
2,600,000 00				136,450 00				12 23				16,062 96			
27,413,185 71				2,000,000 00				79 00				25,316 45			
13,500,000 00				8,437,200 00				468 50				58,537 66			
4,000,000 00				3,997,350 00				148 45				49,186 00			
15,000,000 00				14,377,891 45				582 00				26,997 06			
1,800,000 00				1,786,200 00				64 74				24,703 42			
5,000,000 00				4,637,300 00				100 00				32,630 62			
2,650,000 00				2,037,110 00				70 55				40,237 00			
2,500,000 00				75,802 75				6 53				28,956 78			
1,000,000 00				2,084,800 00				123 10				13,718 40			
15,000 00				855,500 00				113 42				16,953 82			
1,500,000 00				Bonds issued by village of St. Clairsville, O. L. 76				6 65				123 10			
2,000,000 00				(a) 459,231 51				46 00				19,983 29			
7,000,000 00				1,547,062 50				65 87				27,701 13			
6,500,000 00				4,355,350 00				895 40				11,015 05			
43,651,800 00				761,036 27				68 70				12,964 81			
\$422,553,188 92				43,651,800 00				2,556 88				17,038 94			
\$347,709,785 49				11,475 65				5,725 91				\$185,926,026 17			

(a) Not reported.  
 (b) Taken from report of 1877.  
 (c) Not counted in total.  
 (d) From report of 1880.  
 (e) This is the capital of the company extending over only the 393 miles of road constructed by company. 1952 miles are in Ohio.

TABLE IX.—DEBT.

Name and how operated.	Funded.		Unfunded.		Total.		Proportion for Ohio.
	Amount.	Per mile.	Amount.	Per mile.	Amount.	Per mile.	
Alliance and Lake Erie R. R.—Company.....	\$150,000 00	\$6,000 00			\$150,000 00	\$6,000 00	\$150,000 00
Baltimore and Ohio R. R. Co.—							
Central Ohio R. R. (under lease).....	7,744,000 00	29,489 71	\$3,685,148 93	314,033 31	11,429,148 43	43,523 02	4,801,026 54
Newark, Somerset and Strainsville R. R. (under lease).....	2,500,000 00	18,209 63			2,500,000 00	18,209 63	2,500,000 00
Sandusky, Mansfield and Newark R. R. (under lease).....	800,000 00	18,181 81	256,901 59	5,838 67	1,056,901 59	24,020 49	1,056,901 59
Bellaire and Southwestern R'y.—Company.....	2,300,000 00	19,784 94	316,006 00	2,718 29	2,616,006 00	22,403 23	2,616,006 00
Bowling Green R. R.—Lessee and Company.....	325,000 00	7,735 71	None.		325,000 00	7,735 71	325,000 00
Cellina, Van Wert and State Line R'y.—Company (till March 5; sold then to C. V. W. & M. R. Co.).....	(r) 3,000 00	145 50	(s) 2,200 00	40 00	5,200 00	185 50	(r) 5,200 00
Chagrin Falls and Southern R. R.—Company (from February 1, 1881).....	(g) 23,000 00	2,190 47	(g) 40,000 00	3,809 52	(g) 63,000 00	5,999 99	(g) 63,000 00
Cincinnati and Eastern R'y.—Company.....	(a) 601,200 00	8,841 18	(a) 12,589 94	185 14	(a) 613,789 94	9,026 32	(a) 613,789 94
Cincinnati, Georgetown and Portsmouth R. R.—Company (from September 13, 1880).....	240,000 00	(a)	(a)	(a)	240,000 00	(a)	240,000 00
Cincinnati, Hamilton and Dayton R. R.—Company.....	2,951,000 00	49,183 33	(h)		2,875,338 55	47,922 64	2,875,338 55
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership).....	2,500,000 00	25,458 25	949,009 03	9,064 65	3,449,009 03	35,122 90	684,896 55
Cincinnati, Richmond and Chicago R. R. (lease).....	616,000 00	13,842 70	2,207 09	49 59	618,207 09	13,892 29	618,207 09
Dayton and Michigan R. R. (lease).....	2,728,500 00	19,240 40	561,903 39	4,015 19	3,290,403 39	23,405 59	3,290,403 39
Cincinnati, Indianapolis, St. Louis and Chicago R'y.—Company.....	7,499,800 00	41,891 30	895,054 54	4,999 47	8,394,854 54	46,890 77	1,034,410 39
Harrison Branch R. R. (under license).....	None.						
Cincinnati Northern R'y.—Company.....	1,000,000 00	24,691 33			1,000,000 00	24,691 33	1,000,000 00
Cincinnati and Portsmouth R. R.—Receiver (till Sept. 13; sold to C. G. & P. R. R. Co.).....	(g) 5,100 00	255 00	(g) 162,614 61	8,130 73	(g) 167,714 61	8,385 73	(g) 167,714 61
Cincinnati Southern R'y.—Company.....	None.						
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to I. B. & W.).....	18,016,000 00	53,619 05			18,016,000 00	53,619 05	54,323 35
Columbus, Springfield and Cincinnati R. R. (till May 1; leased to I. B. & W.).....	2,956,913 10	13,883 79	(c)		2,345,100 48	13,814 21	2,345,100 48
Cincinnati, Van Wert and Michigan R. R. (I. J. C., V. W. & M. C. Co. from March 5; construction contract).....	1,000,000 00	22,587 75	90,242 00	2,033 85	1,090,242 00	24,571 60	1,090,242 00
Cincinnati and Westwood R. R.—Company.....	390,000 00	30,000 00	None.		390,000 00	30,000 00	390,000 00
Cleveland, Columbus, Cincinnati and Indianapolis R'y.—Company.....	63,000 00	11,190 05	32,768 02	5,497 98	95,768 02	16,688 03	95,768 02
Cleveland and Springfield R'y (under lease).....	6,430,000 00	16,461 71	(d)		6,113,131 53	15,633 72	4,793,298 55
Cleveland and Marietta R. R.—Company.....	2,651,000 00	55,171 70	1,667,291 77	34,699 10	4,318,291 77	89,870 80	4,318,291 77
Cleveland, Mt. Vernon and Delaware R. R.—Receiver.....	None.		67,392 21	673 92	67,392 21	673 92	67,392 21
Cleveland, Painesville and Ashtabula R. R.—Company—not reported.....	4,990,741 91	28,400 04			4,990,741 91	28,400 04	4,990,741 91
Cleveland, Tuscarawas Valley and Wheeling R'y.—Company.....			684,780 91	4,320 38	4,902,859 91	30,972 87	4,902,859 91
College Hill R. R.—Company (from May 1, 1881).....	4,215,079 03	26,612 48	(e)		60,000 00	10,000 00	60,000 00
Columbus and Hocking Valley R. R.—Company.....	60,000 00	60,000 00			2,172,917 97	21,729 97	2,172,917 97
Columbus and Maysville R'y.—Company.....	2,500,000 00	22,321 43	(e)		3,785 55	3,785 55	70,285 08
Columbus and Toledo R. R.—Company.....	61,400 00	3,283 42	8,885 08	475 13	3,033,385 55	25,811 66	3,033,385 55
Columbus and Washington R. R.—Company.....	2,896,000 00	21,604 93	142,385 55	1,209 73	125,772 65	5,377 19	125,772 65
Columbus, Washington and Cincinnati R. R.—E. L. Harper et al.....	(f) 120,000 00	5,130 39	(h) 5,772 65	246 80	1,787,000 00	29,384 38	1,787,000 00
Coanotton Valley R'y.—Company.....	(i) 1,787,000 00	29,684 38					
Dayton and Southeastern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.).....	(a)	(n)	(a)	(a)	(g) 1,070,675 89	9,310 22	(g) 1,070,675 89

Dayton and Union I. R.—Trustee.	451,444 88	14,223 21	(j)	442,251 58	13,965 04	442,251 58
Porter Ohio R. R.—W. H. & C. B. Stone—No bonds and no stock						
Indiana, Bloomington and Western R'y Co.—Ohio Div. (from May 1)						
Cincinnati, Sandusky and Cleveland R. R. } (See C, S. & C.)						
Columbus, Springfield and Cincinnati R. R. }						
Iron R. R.—Company	None.		None.			
Lake Erie and Western R'y—Company	7,727,700 00	19,996 00	264,764 32	7,991,764 32	20,681 01	3,013,223 15
Lake Shore and Michigan Southern R'y—Company	37,186,000 00	36,281 95	None.	37,189,000 00	36,281 95	13,760,427 51
Chicago and Canada Southern R'y (by stock ownership and special agreement)						
Maumee and Caledonia R. R. (under lease)	2,541,000 00	38,106 51	1,436,453 58	3,977,453 58	58,838 07	264,771 32
Marquette and Cincinnati R. R.—Receiver.	1,496,006 00	34,239 03	323,933 70	1,819,933 70	41,703 54	1,809,933 70
Baltimore Short Line R'y (special agreement)	(12) 13,303,865 61	(14) 219 16	(k) 5,033,148 14	(k) 18,336,813 58	(k) 66,461 31	(k) 18,336,813 58
Cincinnati and Baltimore R'y (special agreement)	750,000 00	24,727 99	750,000 00	24,727 99	24,727 99	750,000 00
New York, Pennsylvania and Ohio R. R.—Company	500,000 00	86,206 89	(l)	500,000 00	86,206 89	500,000 00
Cleveland and Mahoning Valley R'y (under lease)	86,822,015 00	205,160 23		86,801,024 28	205,087 00	50,823,480 68
Ohio Central R. R.—Company	1,907,600 00	15,921 00		1,907,600 00	15,921 00	1,907,600 00
Ohio and Mississippi R'y—Receiver	8,040,000 00	36,982 00	306,042 28	8,346,042 28	38,390 00	8,346,042 28
Ohio and West Virginia R'y—Company	12,835,000 00	20,829 27	1,302,433 95	(t) 14,137,433 95	22,942 92	447,845 80
Painesville, Canton and Bridgeport N. G. R. R.—Company and Re-	1,584,000 00	19,215 00	34,810 99	1,618,810 99	19,270 41	1,618,810 99
Painesville and Youngstown R'y—Company	(a)	(a)	(a)	(a)	(a)	(a)
Paulding and Cecil R'y—Company	1,304,200 00	22,655 72	(m) 21,679 17	1,279,917 53	19,901 57	1,279,917 53
Pennsylvania Company—	None.			3,387 37	3,387 37	21,679 17
Ashabula and Pittsburgh R'y (under lease)	1,500,000 00	23,960 13	(n)	1,488,737 70	23,780 07	1,488,727 70
Cleveland and Pittsburgh R. R. (under lease)	5,144,343 63	26,026 22	(p)	5,144,343 63	26,026 22	4,755,771 18
Lawrence R. R. (under lease)	355,000 00	19,744 15	None.	319,239 14	17,755 23	151,511 84
Massillon and Cleveland R. R. (under lease)	100,000 00	8,176 61	(q)	80,916 39	6,616 22	80,916 39
North Western Ohio R'y (under lease)	None.		22,338 28	22,338 28	282 76	22,338 28
Pittsburgh, Ft. Wayne and Chicago R'y (under lease)	13,510,000 00	28,849 00		13,510,000 00	28,849 00	7,961,300 40
Pittsburgh, Cincinnati and St. Louis R'y—Company	12,617,000 00	63,085 00	715,044 44	13,332,044 44	66,660 32	10,570,639 28
Cincinnati and Muskingum Valley R'y (under lease)	1,500,000 00	10,101 41	672,345 73	2,172,345 73	14,633 32	2,172,345 73
Columbus, Chicago and Indiana Central R'y (under lease)	25,022,441 65	45,818 62	100,696 71	25,403,138 36	43,991 64	9,982,863 04
Columbus and Xenia R. R. (under lease)	1,802,000 00	5,516 38		1,802,000 00	5,516 38	1,802,000 00
Little Miami R'y (under lease)	1,500,000 00	15,000 00		1,500,000 00	15,000 00	1,500,000 00
Pittsburgh and Lake Erie R. R.—Company	2,000,000 00	28,429 28	8,894 73	2,008,914 73	40,638 44	373,873 64
Rocky River R. R.—Company	35,000 00	6,630 00		35,000 00	6,630 00	35,000 00
Scioto Valley R'y—Company	218,780 00	17,772 54	140,139 14	2,327,959 14	18,910 96	2,327,959 14
Springfield Southern R. R.—Company	583,200 00	5,141 95	176,596 49	759,796 49	6,098 96	759,796 49
St. Clairsville and Northern R'y—Company	30,000 00	8,571 43		30,000 00	8,571 43	30,000 00
St. Clairsville R'y—Company	None.		5,500 00	5,500 00	830 00	5,500 00
Toledo, Ann Arbor and Grand Trunk R'y—Company (from Oct. 15)	750,000 00	16,304 34	25,282 43	775,282 43	16,853 95	84,269 75
Toledo, Canada Southern and Detroit R'y (by C. S. R'y Co.; stock ownership)						
Toledo, Delphos and Burlington R. R.—Company	1,500,000 00	26,848 04	1,267,466 12	2,767,466 12	49,534 03	425,992 65
Valley Railway—Company	4,000,000 00	(a)	(a)	4,000,000 00	11,653 79	3,657,663 58
Wabash, St. Louis and Pacific R'y—Company	1,764,851 50	30,065 13	64,923 22	1,829,804 72	31,172 14	1,829,804 72
	49,406,858 27	19,306 70	2,310,898 07	51,716,756 34	20,209 75	1,515,731 25
Totals	\$380,063,084 41		\$24,464,914 28	\$403,809,178 09		\$200,104,673 29

(a) Not given. (b) Surplus cash, \$75,641.45. (c) Surplus cash, \$11,812.22. (d) Surplus cash, \$323,868.47. (e) Surplus cash, \$66,914.80. (f) Liquidated by sale of road August, 1879. (g) Not counted in total. (h) From report of 1878. (i) This is the amount actually issued on the 60.2 miles constructed. (j) Surplus cash, \$91,950.30. (k) From report of 1877. (l) Surplus cash, \$31,990.72. (m) Surplus cash, \$1,272.30. (n) Surplus cash, \$11,272.30. (o) Surplus cash, \$35,760.86. (p) Surplus cash, \$19,083.61. (q) From report of 1880. (r) This is the debt on the 616.2 miles owned by the company, 19.32 miles are in Ohio.



TABLE X.—PAID IN STOCK AND DEBT.

Name, and how operated.	Stock and debt.			Ohio stockholders.	
	Total.	Per mile.	Proportion for Ohio.	Number.	Amount held by them.
Alliance and Lake Erie Railroad—Company.....	\$250,000 00	\$10,000 00	\$250,000 00	5	\$250 00
Baltimore and Ohio Railroad Company.....	12,932,588 93	49,248 28	5,432,577 77	4	250 00
Baltimore and Ohio Railroad Company.....	5,358,850 00	39,033 08	5,358,850 00	295	290,350 00
Central Ohio Railroad (under lease).....	2,070,501 59	29,854 54	2,070,501 59	248	96,150 00
Newark, Somerset and Straitsville Railroad (under lease).....	3,689,504 00	31,737 07	3,689,504 00	58	655,500 00
Sandusky, Mansfield and Newark Railroad (under lease).....	492,498 85	11,726 16	492,498 85	898	137,250 00
Bellevue and Southwestern Railway—Company.....	13,200 00	2,400 00	13,200 00		
Bowling Green Railroad—Company.....	73,650 00	7,014 29	(g)	13	10,650 00
Celina, Van Wert and State Line Railway—Company (till March 5; sold then to C. V. W. & M. Railroad Company).....	27,050 00	5,410 00	(g)	17	27,050 00
Chagrin Falls and Southern Railroad—Company (from February 1, 1881).....	856,217 40	12,591 43	856,217 40	1909	242,427 46
Cincinnati and Eastern Railway—Company.....	353,450 00	12,428 07	353,450 00	7	113,400 00
Cincinnati, Georgetown and Portsmouth Railroad—Company (from September 13, 1880).....	6,375,358 55	106,255 95	6,375,358 55	314	2,798,200 00
Cincinnati, Hamilton and Dayton Railroad Company.....	3,728,855 33	37,371 85	740,451 07	97	205,966 00
Cincinnati, Hamilton and Indianapolis Railroad (stock ownership).....	1,000,807 09	28,153 90	1,000,807 09	16	382,600 00
Dayton and Cincinnati Railroad (lease).....	6,907,565 69	49,089 40	6,907,565 69	338	3,509,827 53
Dayton and Michigan Railroad (under lease).....	12,391,854 54	69,253 39	1,527,258 59	108	2,832,200 00
Harrison Branch Railroad (under lease).....	200,000 00	25,806 45	(u)	17	190,150 00
Cincinnati Northern Railway—Company.....	262,550 43	13,127 47	(g)	650	32,500 00
Cincinnati and Portsmouth Railroad—Receiver (till Sept. 13; sold to C. G. & P. R. R. Co.).....	1,752,500 00	5,218 90	(b)	135	1,739,100 00
Cincinnati Railroad Company.....	18,016,000 00	53,619 05	(v)	(a)	(a)
Cincinnati Southern Railway (under license).....	6,791,700 55	40,007 66	6,791,700 55	4	6,050 00
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to L. B. & W.).....	2,090,242 09	47,109 35	2,090,242 09		
Columbus, Springfield and Cincinnati Railroad (till May 1; leased to L. B. & W.).....	(a)				
Cincinnati, Van Wert and Michigan Railroad (by C. V. W. & M. C. Company, from March 5; construction contract).....	165,268 02	28,349 05	165,268 02	12	100,000 00
Cincinnati and Westwood Railroad—Company.....	21,066,931 53	53,361 99	16,544,746 18	88	123,800 00
Cleveland, Columbus, Cincinnati and Indianapolis Railway—Company.....	5,418,291 77	113,777 80	3,418,291 77	14	724,000 00
Cincinnati and Springfield Railroad (under lease).....	1,285,392 21	13,093 53	1,285,392 21	30	
Cleveland and Marietta Railroad—Company.....	5,800,622 36	40,987 45	5,800,622 36	572	147,518 00
Cleveland, Mt. Vernon and Delaware Railroad—Receiver.....	80,000 00	19,457 51	80,000 00		
Cleveland, Painesville and Ashtabula Railroad—Company.....	6,108,809 94	38,541 39	6,108,809 94	502	795,550 00
Cleveland, Hills and Wheeling Railroad—Company.....	157,600 00	26,166 67	157,600 00		
College Hill Railroad—Company (from May 1, 1881).....	5,000,000 00	41,632 86	5,000,000 00	416	2,206,950 00
Columbus and Hocking Valley Railroad—Company.....	130,685 08	5,988 50	130,685 08	414	60,400 00
Columbus and Maumee Valley Railroad—Company.....	4,077,885 55	34,646 43	4,077,885 55	1240	990,500 00
Columbus and Toledo Railroad—Company.....	187,300 00	7,014 39	187,300 00		
Columbus, Washington and Cincinnati Railroad—Receiver (till May 21).....	5,000,000 00		(g)		
Conotton Valley Railway—Company.....	1,563,613 36	13,206 64	(g)		
Dayton and Southwestern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.).....	528,151 56	16,652 56	(g)	17	76,400 00
Dayton and Union Railroad—Trustee.....	(a)				
Eastern Ohio Railroad—Trustee.....					
Indiana, Bloomington and Western Railway Company.....					



Cincinnati, Sandusky and Cleveland Railroad } Ohio Division (from May 1)	
Columbus, Springfield and Cincinnati Railroad	
Iron Railroad—Company	\$399,700 00
Lake Erie and Western Railway—Company	15,691,764 32
Lake Shore and Michigan Southern Railway (by stock ownership and special agreement)	87,189,000 00
Maohoning (ool Railroad (under lease)	6,641,853 58
Maricetta and Cincinnati Railroad—Receiver	3,182,933 70
Baltimore Short Line Railroad—(special agreement)	(n) 32,236,813 58
Cincinnati and Baltimore Railway (special agreement)	1,747,450 00
Cleveland and Mahoning Valley Railway (under lease)	131,860,374 28
Ohio Central Railroad—Company	4,726,800 00
Ohio and Mississippi Railway—Receiver	20,346,042 28
Ohio and West Virginia Railway—Company	48,167,133 95
Painesville, Canton and Bridgeport N. G. Railroad—Company and Receiver (till Feb'y 1, sold to C. F. & S.)	2,368,810 99
Painesville and Youngstown Railway—Company	(a) 1,364,200 00
Paulding and Cecil Railway—Company	34,928 17
Pennsylvania Company	3,147,219 28
Alleghenia and Pittsburgh Railway (under lease)	16,388,679 94
Lawrence Rail and (under lease)	805,000 00
Massillon and Cleveland Railway (under lease)	296,450 00
North Western Ohio Railroad (under lease)	2,022,338 28
Pittsburgh, Ft. Wayne and Chicago Railway (under lease)	40,924,185 71
Cincinnati and Cincinnati and St. Louis Railway—Company	21,769,294 44
Cincinnati and Muskingum Valley Railway (under lease)	6,169,615 73
Columbus and Xenia Railroad (under lease)	39,879,833 10
Little Miami Railway (under lease)	2,068,200 00
Pittsburgh and Lake Erie Railroad—Company	6,137,300 00
Rocky River Railroad—Company	6,896,024 73
Seloto Valley Railway—Company	4,412,730 14
Springfield Southern Railway—Company	1,285,296 49
St. Clairsville Northern Railway—Company	30,000 00
St. Clairsville Railway—Company	18,500 00
Toledo, Ann Arbor and Grand Trunk Railway—Company (from October 15)	1,234,513 94
Toledo, Cana'a Southern and Detroit Railway (by C. S. Railway Co.; stock ownership)	4,316,128 62
Toledo, Delphos and Burlington Railroad—Company	8,955,350 00
Valley Railway—Company	2,965,409 99
Wabash, St. Louis and Pacific Railway—Company	91,292,802 95
Totals	\$750,684,820 19

(a) Not given.  
 (b) All stock.  
 (c) Given under C. S. & C.  
 (d) Not counted in total, because merged into consolidated capital, or extinguished during the year.

22,205 55	399,700 00	26	375,900 00
40,607 00	5,916,193 80	4	1,300 00
85,076 25	87,124,133 08	549	3,361,500 00
98,296 65	442,834 93	2	15,200 00
73,339 48	* 3,182,933 70	10	645,700 00
117,204 83	82,336,813 58		
65,759 64	1,994,490 00	7	1,550 00
301,285 34	1,747,450 00	127	611,050 00
311,108 12	77,174,405 93	10	500 00
38,320 00	4,726,800 00	10	950 00
93,388 00	20,346,042 28	10	49,600 00
61,940 01	1,209,069 00	19	380,300 00
28,200 41	2,368,810 99	21	750,000 00
22,090 61	1,364,200 00	17	53,925 00
5,457 68	34,929 17	5	250 00
50,271 85	3,147,219 28	358	102,750 00
48,910 48	15,150,860 19	287	40,365 00
40,161 58	4,294,87 54	10	12,550 00
21,239 57	296,450 00	18	66,400 00
25,569 21	2,022,338 28	3	150 00
87,386 68	21,995,249 22	152	31,785 00
108,846 32	17,574,999 44	100	471,650 00
65,522 04	6,169,615 73	165	68,600 00
38,147 60	9,318,997 44	230	31,700 00
61,373 00	2,088,200 00	230	1,460,600 00
69,595 22	6,137,300 00	712	3,155,650 00
20,048 40	640,276 04	(a)	(a)
35,846 78	110,862 73	36	75,862 75
4,412,730 14	4,412,730 14	(a)	(a)
11,332 18	1,285,296 49	8	525,500 00
8,571 43	30,000 00		
2,782 95	18,500 00		
26,857 24	134,186 20	6	113,100 00
75,445 30	648,829 58	4	43,750 00
(a)	8,955,350 00	1349	423,750 00
44,136 98	2,965,409 99	904	705,640 00
36,852 28	2,762,421 00	(a)	(a)
	\$380,750,566 49	13,627	\$32,316,966 74

(m) From report of 1880.  
 (n) From report of 1877.  
 (o) No debt, all stock.  
 (p) No stock, all debt.

TABLE XI.—Cost of Road and Equipment.

Name and how operated.	Cost.			Cost per mile.			Proportion for Ohio.
	Road.	Equipment.	Total.	Road.	Equipment.	Total.	
Alliance and Lake Erie R. R.—Company .....	\$96,264 89	\$27,550 00	\$123,814 89	\$3,850 60	\$1,192 00	\$4,952 60	\$123,814 89
Baltimore and Ohio R. R. Co. ....	12,036,889 83	180,960 72	12,217,850 55	45,837 35	689 11	46,526 46	5,132,233 80
Baltimore and Ohio and Chicago R. R. (stock ownership).....	1,777,350 00	30,550 00	1,807,900 00	40,394 32	694 32	41,088 64	5,500,000 00
Central Ohio R. R. (under lease).....	3,689,504 00	32,472 00	3,689,504 00	31,737 67	773 14	31,737 67	1,807,900 00
Newark, Somerset and Straitsville R. R. (under lease).....	424,504 83	2,200 00	424,504 83	10,108 12	400 00	10,881 26	3,689,504 00
Sandusky, Mansfield and Newark R. R. (under lease).....	41,430 00	8,200 00	43,630 00	7,582 74	790 36	7,932 71	457,012 83
Bellaire and Southwestern R'y—Company.....	(g)	2,040 00	(g)	5,957 30	408 00	6,474 66	43,630 00
Bowling Green R. R.—Lessee.....	21,654 73	2,040 00	23,694 73	5,730 10	408 00	6,138 10	70,000 00
Celina, Van Wert and State Line R'y—Company (till March 5, sold then to C., V. W. & M. R. Co.).....	68,000 00	2,040 00	70,000 00	5,957 30	408 00	6,474 66	70,000 00
Chagrin Falls and Southern R. R.—Company (from Feb. 1, 1881).....	113,444 15	29,176 82	142,620 97	3,966 57	1,020 16	4,986 73	30,694 73
Cincinnati and Eastern R'y—Company.....	4,247,441 34	1,118,331 71	5,365,773 05	70,790 85	18,636 86	89,427 71	841,885 48
Cin., Georgetown and Portsmouth R. R.—Co. (from Sept. 13, 1880).....	2,496,167 60	28,472 48	2,524,640 08	25,419 22	2,230 60	27,745 82	142,620 97
Cincinnati, Hamilton and Dayton R. R.—Company.....	827,433 29	184,551 98	1,011,985 27	23,275 19	5,191 62	28,466 81	3,365,773 05
Cin., Hamilton and Indianapolis R. R. (stock ownership).....	6,150,047 67	776,334 12	6,926,381 79	43,706 02	5,617 10	49,223 12	540,543 49
Dayton and Michigan R. R. (lease).....	200,000 00	None	200,000 00	25,806 45	None	25,806 45	1,011,985 27
Cincinnati, Indianapolis St. Louis and Chicago R'y—Company.....	286,087 10	56,561 65	342,648 75	11,821 78	1,921 04	13,745 82	6,926,381 79
Harrison Branch R. R. (under lease).....	(g)	(g)	(g)	11,068 68	1,458 00	12,526 68	1,520,277 25
Cincinnati Northern R'y—Company.....	233,373 61	1,587,303 25	1,794,377 63	32,213 03	4,724 12	36,937 15	180,960 72
Cincinnati and Portsmouth R. R.—Receiver (till Sept. 13; sold to C., V. W. & M. R. Co.).....	17,943,577 63	None	17,943,577 63	62,213 03	None	62,213 03	3,126 68
Cincinnati R. R. Co. ....	2,036,615 03	(a)	2,036,615 03	45,900 31	(a)	45,900 31	4,724 12
Cin., Sand'y and Cleve. R. R.—Co. (till May 1; leased to I., B. & W. Co.; Springfield and Cin. R. R. (till May 1; leased to I., B. & W. Co.).....	(a)	(a)	(a)	(a)	(a)	(a)	52,213 03
Cincinnati, Van Wert & Michigan R. R. (by C., V. W. & M. R. Co., from March 5; construction contract).....	132,500 00	22,443 50	154,943 50	23,534 63	4,201 92	27,736 55	52,213 03
Cincinnati and Westwood R. R.—Company.....	3,100,000 00	651,000 00	3,751,000 00	61,516 13	13,548 39	75,064 52	6,221,026 13
Cincinnati, Columbus, Cin. and Indianapolis R'y—Company.....	296,069 08	96,500 00	389,569 08	3,015 27	952 23	3,967 50	2,036,615 03
Cleveland and Marietta R. R.—Company.....	4,160,846 83	686,950 00	4,847,796 83	27,344 07	4,769 16	32,113 23	6,221,026 13
Cleveland, Mt. Vernon and Delaware R. R.—Receiver.....	(a)	(a)	(a)	(a)	(a)	(a)	3,967 50
Cleveland, Painesville and Ashabula R. R.—Company (not reported).....	5,867,211 60	321,542 12	6,188,753 72	37,017 11	2,028 66	39,045 77	32,113 23
Cleveland, Tuscarawas Valley and Wheeling R'y—Company.....	42,500 00	7,500 00	50,000 00	7,083 33	1,250 00	8,333 33	4,847,796 83
College Hill R. R.—Company (from May 1, 1881).....	3,730,893 52	1,679,778 97	5,470,672 49	33,847 26	11,998 02	45,845 28	6,188,753 72
Columbus and Hocking Valley R. R.—Company.....	92,599 85	10,088 92	102,688 67	4,351 86	539 50	4,891 36	50,000 00
Columbus and Maysville R'y—Company.....	3,251,050 13	887,991 80	4,139,041 93	27,624 10	7,344 54	35,166 46	5,470,672 49
Columbus and Toledo R. R.—Company.....	156,100 00	15,700 00	171,800 00	6,674 89	671 23	7,345 12	102,688 67
Columbus, Washington and Cincinnati R. R.—E. L. Harper, et al., Conotton Valley R'y—Co. (built by contractor; cost not known).....	(a)	(a)	(a)	(a)	(a)	(a)	4,139,041 93
Dayton and Southern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.).....	(a)	(a)	(a)	(a)	(a)	(a)	171,800 00
Dayton and Southern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.).....	(a)	(a)	(a)	(a)	(a)	(a)	1,521,410 78

Dayton and Union R. R.—Trustee.	58,053 00	11,100 00	623,336 02	(a)	1,432 26	19,638 82	623,336 02
Eastern Ohio R. R.—W. H. and C. B. Stevens.			64,153 00			8,277 80	64,153 00
Indiana, Bloomington and Western R'y Co.							
Chl., Springfield and Cincinnati R. R. } Ohio Div. (from May 1							
Iron R. R.—Company.	337,320 13	94,610 00	431,930 13			23,996 12	431,930 13
Lake Erie and Western R'y—Company.	14,631,244 65	931,130 17	15,562,374 22		5,256 11	40,272 17	15,562,374 22
Lake Shore and Michigan Southern R'y—Company.	68,862,610 00	14,378,000 00	83,240,610 00		2,409 57	79,391 87	83,240,610 00
C. and C. South. R'y (by st'k ownership and spec'l agree'm't)		(a)			(a)	60,756 29	60,756 29
Maioning Coal R. R. (under lease).	2,766,116 49	None.	5,176,557 58		None.	67,735 40	5,176,557 58
Marienta and Cincinnati R. R.—Receiver.		(a)	2,766,116 49		(a)	67,735 40	2,766,116 49
Baltimore Short Line R'y (special agreement).	(a)	(a)	24,099,764 96		(a)	67,349 63	24,099,764 96
Cincinnati and Baltimore R'y (special agreement).	(a)	(a)	d 1,993,538 81		(a)	65,728 28	d 1,993,538 81
New York, Pennsylvania and Ohio R. R.—Company.	(a)	(a)	1,702,749 00		(a)	304,062 32	d 1,702,749 00
Cleveland and Mahoning Valley R'y (under lease).	(a)	(a)	131,748,563 61		(a)	311,285 71	77,144,069 79
Ohio Central R. R.—Company.	11,383,972 40	1,471,501 93	12,855,474 33		6,768 00	36,698 58	12,855,474 33
Ohio and Mississippi R'y—Receiver.			34,053,540 97		2,900 00	55,263 78	34,053,540 97
Ohio and West Virginia R'y—Company.	2,140,508 33	237,259 68	2,377,768 01			29,003 76	2,377,768 01
Painesville, Canton and Bridgeport N. G. R. R.—Company and Receiver (till February 1; sold to C. F. and S.).	(a)	(a)	1,300,776 46		(a)	21,145 25	1,300,776 46
Painesville and Youngstown R'y—Company.	23,368 46	11,086 71	34,455 17		1,732 30	5,383 62	34,455 17
Paulding & Cecil R'y—Company.							
Pennsylvania Company.							
Ashtabula & Pittsburgh R'y (under lease).	3,149,244 04	None.	3,149,244 04		50,304 52	50,304 52	3,149,244 04
Cleveland and Pittsburgh R. R. (under lease).	12,755,914 99	3,351,151 90	16,306,666 89		17,915 00	82,498 56	16,306,666 89
Lawrence R. R. (under lease).	806,917 72	None.	806,917 72		None.	26,730 52	806,917 72
Massillon and Cleveland R. R. (under lease).	326,914 21	None.	326,914 21		None.	36,611 51	326,914 21
North Western Ohio R'y (under lease).	1,980,997 50	None.	1,980,997 50		None.	25,077 31	1,980,997 50
Pittsburgh, Ft. Wayne and Chicago R'y (under lease).	39,989,406 86	None.	39,989,406 86		None.	85,392 71	39,989,406 86
Pittsburgh, Cincinnati and St. Louis R'y—Company.	16,011,742 13	3,908,030 96	19,949,773 09		18,254 15	97,384 05	19,949,773 09
Cincinnati and Muskegon Valley R'y (under lease).		(a)	5,540,164 38		(a)	37,492 58	5,540,164 38
Columbus, Chicago and Indiana Central R'y (under lease).		(a)	39,922,929 81		(a)	68,505 41	39,922,929 81
Columbus and Xenia R. R. (under lease).		(a)	1,493,146 00		None.	1,493,146 00	1,493,146 00
Dayton and Western R. R. (under lease).		(b)	850,000 00		None.	22,831 05	850,000 00
Little Miami R'y (under lease).		None.	6,237,300 46		None.	22,831 05	6,237,300 46
Pittsburgh and Lake Erie R. R.—Company.	5,262,309 36	974,390 64	6,236,700 00		9,743 90	32,373 03	6,236,700 00
Rocky River R. R.—Company.	4,110,367 66	912,221 80	5,022,589 46		12,866 91	71,258 13	5,022,589 46
Scioto Valley R'y—Company.	1,005,963 53	24,286 64	1,030,250 17		4,391 20	23,784 21	1,030,250 17
Springfield Southern R. R.—Company.	3,905,358 00	255,886 23	4,161,244 23		2,078 69	33,803 77	4,161,244 23
St. Clairsville and Northern R'y—Company.	1,002,710 76	251,454 16	1,254,164 92		1,914 38	11,057 70	1,254,164 92
St. Clairsville R'y—Company.	23,559 87	6,776 25	30,336 12		1,936 07	8,067 46	30,336 12
St. Clairsville, Ann Arbor and Grand Trunk R'y—Co. (from Oct. 1).	584,964 10	2,218 23	18,500 00		48 22	18,500 00	584,964 10
Toledo, Ann Arbor and Grand Trunk R'y (by C. S. R'y Co.).			587,182 33			12,764 83	587,182 33
Toledo, Canada Southern and Detroit R'y (by C. S. R'y Co.).							
Toledo							
Toledo, Delphos and Burlington R. R.—Company.		None.	3,036,129 03		None.	54,342 72	3,036,129 03
Valley Railway—Company.	2,474,612 43	137,095 71	2,611,708 14	(a)	2,335 53	44,492 47	2,611,708 14
Wabash, St. Louis and Pacific R'y—Company.	(a)	(a)	93,919,076 65	(a)	(a)	36,711 02	93,919,076 65
Totals	\$270,975,110 15	\$35,781,200 95	\$696,194,896 07				\$343,991,394 64

Not counted in total.

TABLE XII.—CHARACTERISTICS.

Name and how operated.	Steel rail.		Telegraph.		Passenger and freight stations.			
	Entire line.	In Ohio.	Entire line.	In Ohio.	Entire line.	In Ohio.	With telegraph communication.	
							Entire line.	In Ohio.
Alliance and Lake Erie R. R.—Company	38.50	43.50	271.00	110.31	15	15	34	15
Baltimore and Ohio R. R. Co.	137.29	137.29	137.29	137.29	48	20	17	17
Central Ohio R. R. (under lease)			44.00	44.00	13	13	4	4
Newark, Somerset and Stratitsville R. R. (under lease)	76.79	76.79	116.25	116.25	26	26	14	14
Sandusky, Mansfield and Newark R. R. (under lease)					8	8		
Bellaire and Southwestern R'y—Company			5.50	5.50	2	2	2	2
Bowling Green R. R.—Company								
Celina, Van Wert and State Line R'y—Company (till March 5; sold then to C., V. & M. R. Co.)								
Chagrin Falls and Southern R. R.—Company (from February 1, 1881)			68.00	68.00	2	2		
Cincinnati and Eastern R'y—Company					50	50	10	10
Cincinnati, Georgetown and Dayton R. R.—Company (from Sept. 13, 1880)					17	17	2	2
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership)	59.93	59.93	60.00	60.00	42	42	25	25
Cincinnati, Richmond and Chicago R. R. (lease)	20.00	20.00	98.20	19.50	37	9	15	2
Dayton and Michigan R. R. (lease)	15.00	15.00	44.30	35.55	15	12	6	4
Cincinnati, Indianapolis, St. Louis and Chicago R'y—Company	75.00	75.00	142.09	142.09	34	34	21	21
Harrison Branch R. R. (under lease)	176.90	22.60	82.70	10.10	64	12	36	4
Cincinnati Northern R'y—Company			7.75	7.01	2	2	2	
Cincinnati and Portsmouth R. R.—Receiver (till September 13; sold to C. G. & P. R. Co.)					4	4		
Cincinnati R. R. Co.—					(g) 9	(g) 9	(g) 2	(g) 2
Cincinnati Southern R'y (under license)	22.30	1.01 <sup>6</sup>	2,027.00	12.00	88	2	38	2
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to I. B. & W.)	70.00	70.00	175.00	175.00	80	30	18	18
Columbus Springfield and Cincinnati R. R. (till May 1; leased to I. B. & W.)	19.00	19.00						
Cincinnati, Van Wert and Michigan R. R. (by C., V. W. & M. C. Co. from March 5; construction contract)					5	5		

Cincinnati and Westwood R. R.—Company Cleveland, Columbus, Cincinnati and Indianapolis R'y—Company Cincinnati and Springfield R'y (under lease)	368.47 283.92 48.05	391.15 306.60 80.20	12 61 51	12 65 65
Cleveland and Marietta R. R.—Company Cleveland and Mt. Vernon and Delaware R. R.—Receiver Cleveland, Patnesville and Ashabua R. R.—Company Cleveland, Tuscarawas Valley and Wheeling R'y—Company College Hill R. R.—Company (from May 1, 1881) Columbus and Hocking Valley R. R.—Company Columbus and Mayville R'y—Company Columbus and Toledo R. R.—Company Columbus, Washington and Cincinnati R. R.—Receiver (till May 21) Columbus Valley R'y—Company Dayton and Southeastern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R.) Dayton and Union R. R.—Trustee Eastern Ohio R. R.—Lessee Indiana, Bloomington and Western R'y Co.— (Cincinnati, Sandusky and Cleveland R. R. } Ohio Division (from May 1) Columbus, Springfield and Cincinnati R. R. }	16.00 Not reported. 92.00 104.84 69.50 46.00 See T. D. & B. Included in C, S. & C. 2.50 1,150.16 39.93 9.96 141.70 Included in N. & C. 348.72 Included in N. Y., P. & O. 150.00 357.00 82.00 Included in C, F. & S. Not reported. 7.21 138.45 8.93	16.00 Not reported. 92.00 104.84 69.50 46.00 See T. D. & B. Included in C, S. & C. 2.50 1,150.16 39.93 9.96 141.70 Included in N. & C. 348.72 Included in N. Y., P. & O. 150.00 357.00 82.00 Included in C, F. & S. Not reported. 7.21 138.45 8.93	16.00 Not reported. 92.00 104.84 69.50 46.00 See T. D. & B. Included in C, S. & C. 2.50 1,150.16 39.93 9.96 141.70 Included in N. & C. 348.72 Included in N. Y., P. & O. 150.00 357.00 82.00 Included in C, F. & S. Not reported. 7.21 138.45 8.93	16.00 Not reported. 92.00 104.84 69.50 46.00 See T. D. & B. Included in C, S. & C. 2.50 1,150.16 39.93 9.96 141.70 Included in N. & C. 348.72 Included in N. Y., P. & O. 150.00 357.00 82.00 Included in C, F. & S. Not reported. 7.21 138.45 8.93
Lawrence R. R. (under lease) Massillon and Cleveland R. R. (under lease) North Western Ohio R'y (under lease) Pittsburgh, Ft. Wayne and Chicago R'y (under lease) Cincinnati and Muskingum Valley R'y (under lease) Columbus, Chicago and Indiana (central R'y (under lease) Columbus and Xenia B. R. (under lease) Little Miami R'y (under lease) Pittsburgh and Lake Erie R. R.—Company Rocky River R. R.—Company Scioto Valley R'y—Company	11.76 539.70 219.41 242.00 Included in L. M. 70.35	11.76 539.70 219.41 242.00 Included in L. M. 70.35	11.76 539.70 219.41 242.00 Included in L. M. 70.35	11.76 539.70 219.41 242.00 Included in L. M. 70.35
Pittsburgh and Lake Erie R. R.—Company Rocky River R. R.—Company Scioto Valley R'y—Company	11.76 539.70 219.41 242.00 Included in L. M. 70.35	11.76 539.70 219.41 242.00 Included in L. M. 70.35	11.76 539.70 219.41 242.00 Included in L. M. 70.35	11.76 539.70 219.41 242.00 Included in L. M. 70.35

TABLE XII.—CHARACTERISTICS—Continued.

Name and how operated.	Steel rail.		Telegraph.		Passenger and freight stations.			
	Entire line.	In Ohio.	Entire line.	In Ohio.	Entire line.	In Ohio.	With telegraph communication.	
							Entire line.	In Ohio.
Springfield Southern R. R.—Company.....	.....	.....	113.42	10	10	10	10	10
St. Clairsville Northern R'y.—Company.....	None.	.....	.....	.....	.....	.....	.....	.....
St. Clairsville R'y.—Company.....	.....	.....	46.00	14	2	8	8	1
Toledo, Ann Arbor and Grand Trunk R'y.—Company (from October 15).....	.....	.....	55.87	2	2	2	2	2
Toledo, Canada Southern and Detroit R'y (by C. & S. R'y Co.; stock owner-ship).....	55.87	8.60	493.00	88	67	46	35	.....
Toledo, Delphos and Burlington R. R.—Company.....	7.00	7.00	388.00	21	21	17	17	17
Valley Railway—Company.....	17.00	17.00	59.00	.....	13	11	.....	.....
Wabash, St. Louis and Pacific R'y.—Company.....	969.00	75.00	.....	.....	.....	.....	.....	.....
Totals .....	6,199.77	3,204.42	12,154.15	2371	1464	1458	891	766

(g) Not included in total.





TABLE XII.—CHARACTERISTICS—Continued.

Name and how operated.	Steel rail.		Telegraph.		Passenger and freight stations.			
	Entire line.	In Ohio.	Entire line.	In Ohio.	Entire line.	In Ohio.	With telegraph communication.	
							Entire line.	Number operated by railroad company.
Springfield Southern R. R.—Company.....	None.	.....	113.42	113.42	10	10	10	10
St. Clairsville Northern R'y—Company.....	"	.....	.....	.....	14	2	8	1
St. Clairsville R'y—Company.....	.....	.....	46.00	5.00	.....	.....	.....	.....
Toledo, Ann Arbor and Grand Trunk R'y—Company (from October 15).....	.....	.....	55.87	8.60	2	2	2	2
Toledo, Canada Southern and Detroit R'y (by C., S. R'y Co.; stock owner-ship).....	55.87	8.60	469.00	388.00	88	67	46	.....
Toledo, Delphos and Burlington R. R.—Company.....	7.00	7.00	59.09	59.00	21	21	17	17
Vall-y Railway—Company.....	17.00	17.00	.....	.....	.....	13	11	.....
Wabash, St. Louis and Pacific R'y—Company.....	969.00	75.00	.....	.....	.....	.....	.....	.....
Totals.....	6,199.77	3,204.42	12,154.15	6,389.86	2371	1464	1458	766

(g) Not included in total.

TABLE XIII.—BRIDGES, TRESTLES, FENCE AND TUNNELS IN OHIO.

(a) Estimated. (b) Not given. (c) Greater part fenced by land owners at their own expense.

(d) Also 6 pile bridges, renewed every five years—aggregate length, 200 feet.



Name, and how operated.	Locomotives.	Express and baggage cars.	Passenger cars.	Parlor and sleeping cars.	Freight cars.	Other cars.	Crossings in Ohio.						Highway bridges.		
							Railroad.		Highway.						
							Grade.	Over or under.	Grade.		Over railroad.	Under railroad.			
									Without protection.	Protected.					
Alliance and Lake Erie R. R.—Company	2	1	1		57		1						18 feet above.	Less than 18 feet.	
Baltimore and Ohio R. R. Co.	(a)	(a)	(a)	(a)	364	(a)	8			126		2	5		
Baltimore and Ohio and Chicago R. R. (stock ownership)	(a) 38	(a)	(a)	(a)	(a)	(a)	5			105	1	15	2		
Central Ohio R. R. (under lease)	(a) 13	(a)	(a)	(a)	(a)	(a)	1			39		2	1	1	1
Newark, Somerset and Stratsville R. R. (under lease)	(a) 32	(a)	(a)	(a)	(a)	(a)	8			149		3	1	3	
Sandusky, Mansfield and Newark R. R. (under lease)	(a) 32	1	3		4	23				8		3	1	3	
Bellaire and Southwestern R'y—Company	2	1	1		(b)					8					
Bowling Green R. R.—Company	Inclu	ded	in C.		V. W. & M.		1			67			1		
Celina, Van Wert and State Line R'y—Company (till March 5; sold then to C. V. W. & M. R. Co.)	1	1	7		70		1			8					
Chagrin Falls and Southern R. R.—Company (from Feb. 1, 1881)	5	2	7												
Cincinnati and Eastern R'y—Company	2	1	3		21				1	27			2		
Cincinnati, Georgetown and Portsmouth R. R.—Company from September 13, 1880	33	13	35		674	14	2			90	17	1	5	4	
Cincinnati, Hamilton and Dayton R. R.—Company	15	4	6		469	10						5	5	7	1
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership)	8	3	2		206	1						3	3		
Cincinnati, Richmond and Chicago R. R. (lease)	33	4	15		704	13	3			226	5	2	1		
Dayton and Michigan R. R. (lease)	62	14	52		9	6	1			14	1	2			
Cincinnati, Indianapolis, St. Louis and Chicago R'y—Company	Inclu	ded	in C.		L. St. L. & C.					10					
Harrison Branch R. R.—(under lease)	None	reported.													
Cincinnati Northern R'y—Company	Inclu	ded	in C.		G. & P.										
Cincinnati and Portsmouth R. R.—Receiver (till Sept. 13; sold to C. G. & P. R. R. Co.)	54	12	24		4	31	4				1	25	4	25	
Cincinnati R. R. Co.															
Cincinnati Southern R'y (under license)	31	12	21		(c)		17								
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to L. B. & W.)	Inclu	ded	in C.		3 & C.					(c)	(c)	(c)	(c)	(c)	(c)
Columbus, Springfield and Cincinnati R. R. (till May 1; leased to L. B. & W.)	1	1	1		11		1			(c)	2	5	5	5	
Cincinnati, Van Wert and Michigan R. R. (by C. V. W. & M. R. Co. from March 5; construction contract)	2	23	58		4,286	81	11			238	20	5	5	5	
Cincinnati and Westwood R. R.—Company	146	6	15		275	10	5			115		1	1		
Cleveland, Columbus, Cincinnati and Indianapolis R'y—Company															
Cincinnati and Springfield R'y (under lease)	16														









[illegible]

(a) 1 General Manager, 1 Master of Transportation, 1 Master of Road, 1 Assistant Master of Machinery. (b) General Manager. (c) 1 Superintendent and 1 General Manager. (d) Assistant Superintendent. (e) Includes track foreman. (f) Includes firemen. (g) 1 General Manager, 1 Superintendent, 1 Master Mechanic. (h) Includes station agents. (i) Includes general officers, superintendents and their clerks. (j) Includes firemen and wipers. (k) Includes Master Mechanic and his clerks. (l) Includes machinists and helpers. (m) Includes conductors and baggage men.

(a) 1 General Manager, 1 Master of Transportation, 1 Master of Road, 1 Assistant Master of Road, 1 Master of Machinery. (b) General Manager. (c) 1 Superin-

tendent and 1 General Manager. (d) Assistant Superintendent. (e) Includes firemen. (f) Includes track foreman. (g) 1 General Manager, 1 Superintendent, 1 Mas-

Master Mechanic, (h) Includes station agents, (i) Includes general officers, superintendents and their clerks, (j) Includes firemen and wipers, (k) Includes Master Mechanic and his clerks, (l) Includes machinists and helpers (m) Includes conductors and baggage men

ВНЕШНЕГО МИРА ИЛИ ВОЗМОЖНОСТИ  
(1) ВОЗМОЖНОСТИ ВОЗМОЖНОСТИ ВОЗМОЖНОСТИ  
(2) ВОЗМОЖНОСТИ ВОЗМОЖНОСТИ ВОЗМОЖНОСТИ

TABLE XVI.—LOSSES, DAMAGES, ETC., PAID.

Name, and how operated.	For injuries in Ohio to—					For animals killed in Ohio.					
	On goods and baggage.	Passengers.	Employees.	Others.	Total.	Horses.	Mules.	Cattle.	Sheep.	Hogs.	Amount.
Alliance and Lake Erie Railroad—Company.....		\$100 00			\$100 00			3	14		\$126 00
Baltimore and Ohio Railroad—Company.....											
Baltimore and Ohio and Chicago Railroad (stock ownership).....											
Central Ohio Railroad (under lease).....											
Newark, Somerset and Stratfield Railroad (under lease).....	(a)							6	13		135 00
Sandusky, Mansfield and Newark Railroad (under lease).....								6			113 00
Bellaire and Southwestern Railway—Company.....	\$21 55	581 45	\$19 00		600 45				6		12 00
Bowling Green Railroad—Company.....	(a)							3	8	1	77 00
Celina, Van Wert and State Line R'y—Company (till March 5; sold then to C., V. W. & M. Railroad Company).....	(a)										
Chagrin Falls and Southern Railroad—Company (from February 1, 1885).....	(a)										
Cincinnati and Eastern Railway—Company.....						1		3		6	143 63
Cincinnati, Georgetown and Portsmouth Railroad—Company (from September 13, 1880).....	(a)	16,794 98	1,173 97	\$750 00	18,718 95	2		6			301 15
Cincinnati, Hamilton and Indianapolis Railroad (stock ownership).....	2,717 91		114 00		114 03	11	1	34	5	5	1,456 03
Cincinnati, Richmond and Chicago Railroad (lease).....	1,444 54		518 80		518 80	2	1	6			235 00
Dayton and Michigan Railroad (lease).....	6,847 46		843 10		843 10	2		3			212 50
Cincinnati, Indianapolis, St. Louis and Chicago Railway—Company.....											
Harrison Branch Railroad (under lease).....	2,941 56		47 35	181 50	228 85	3		3		15	243 50
Cincinnati Northern Railway—Company.....	Included	in C., I., St. L. & C.									
Cincinnati and Portsmouth Railroad—Receiver (till Sept. 13; sold to C., G. & P. Railroad Company).....	(a)										
Cincinnati Railroad Company.....	16,387 37		145 00	200 00	345 00						
Cincinnati Southern Railway (under license).....											
Cincinnati, Sandusky and Cleveland Railroad—Company (till May 1; leased to L., B. and W.).....	417 74		1,104 80		1,104 80	7		8	51		1,039 90
Columbus, Springfield and Cincinnati Railroad (till May 1; leased to L., B. & W.).....	Included	in C. S. & C.									
Cincinnati, Van Wert and Michigan Railroad (by C., V. W. & M. C. Co., from March 5; construction contract).....	(a)										
Cincinnati and Westwood Railroad—Company.....											
Cleveland, Columbus, Cincinnati and Indianapolis Railway—Company.....	7,450 57	906 00	3,044 24	3,751 90	7,702 14	25	4	72	69	72	2,703 40
Cincinnati and Springfield Railway (under lease).....	7,228 98	2,500 00	994 35	103 75	3,508 10	2	4	6	1	3	350 50

	227 97	777 59	777 59	779 59	1	7	24	231 25
Cleveland and Marietta Railroad—Company	227 97	777 59	777 59	779 59	1	7	24	231 25
Cleveland, Mt. Vernon and Delaware Railroad—Receiver	225 00					12		252 00
Cleveland, Painesville and Ashabula Railroad—Company	Not reported.							
Cleveland, Tuscarawas Valley and Wheeling Railway—Company								
College Hill Railroad—Company (from May 1, 1881)	463 07	281 40	281 40	336 40	9	28	46	7 1,391 92
Columbus and Hocking Valley Railroad—Company	(a)							
Columbus and Maysville Railway—Company	281 82	1,166 65	295 00	1,461 65	5	1	101	1 896 50
Columbus and Toledo Railroad—Company	(a)							
Columbus, Washington and Cincinnati Railroad—Receiver (till May 21)	148 81	178 00	500 00	678 00	4	1	6	5 435 87
Conotton Valley Railway—Company	9 32							
Dayton and Southern Railway—Receiver (till May 21)	1,511 25				1	12	6	149 00
Dayton and Union Railroad—Trustee	428 85	1,131 50	1,131 50	1,131 50	(b)	(b)	(b)	531 00
Eastern Ohio Railroad—Lessee	87 86				1	2		57 50
Indiana, Bloomington and Western Railway—Company	(a)							
Cincinnati, Sandusky and Cleveland R. R. } Ohio Division								
Cincinnati, Springfield and Cincinnati R. R. } (from May 1)								
Iron Railroad—Company	127 85	2,276 20		2,276 20		7		112 00
Lake Erie and Western Railway—Company	3,136 19	956 87		956 87	20	54	8	1,878 73
Lake Shore and Michigan Southern Railway—Company	39,582 14	810 60		3,591 45	5	24	45	5 1,188 46
Chicago and Canada southern Railway (by stock ownership and special agreement)	(a)							
Manioning Coal Railroad (under lease)	Included	in L. S. & M. S.						
Marietta and Cincinnati Railroad—Receiver	13,510 39	800 00	784 85	6,819 30	18	1	13	36 1,768 25
Baltimore Short Line Railway (special agreement)	Included	in M. & C.						
Cincinnati and Baltimore Railway (special agreement)	Included	in M. & C.						
New York, Pennsylvania and Ohio Railroad—Company	4,217 16	833 58	100 00	936 58		20	36	512 00
Cleveland and Mahoning Valley Railway (under lease)	Included	in N. Y., P. & O.						
Ohio Central Railroad—Company	98 30	681 85		681 85		3	15	99 50
Ohio and Mississippi Railway—Company	17,138 82					5		123 00
Ohio and West Virginia Railway—Company	62 43					3		53 53
Painesville, Canton and Bridgeport N. G. Railroad—Company	(a)							
Painesville and Receiver (till Feb'y 1, sold to C. F. & S.)	9 03							
Painesville and Youngstown Railway—Company	(a)	59 00		59 00	1	9		334 00
Paulding and Cecil Railway—Company								
Pennsylvania Company								
Ashabula and Pittsburgh Railway (under lease)	58 58							
Cleveland and Pittsburgh Railroad (under lease)	1,487 72	2,011 00	1,650 75	6,635 27	24	(b)	61	2,896 14
Lawrence Railroad (under lease)	78 89				2	4	18	316 63
Massillon and Cleveland Railroad (under lease)	(a)							
North Western Ohio Railway (under lease)	200 55	24 00		21 00		(b)		30 00
Pittsburgh, Ft. Wayne and Chicago Railway (under lease)	13,055 28	6,100 00	4,000 00	10,290 00	11	42	23	1,823 00
Pittsburgh, Cincinnati and St. Louis Railway—Company	8,418 55	727 00	1,165 00	1,892 00	8	43	86	41 552 00
Cincinnati and Muskingum Valley Railway (under lease)	304 05	5 00	167 05	172 05	3	1	5	9 345 00
Columbus, Chicago and Indiana Central Railway (under lease)								
Columbus and Xenia Railroad (under lease)	3,472 89	3,200 00	2,148 67	14,366 57	6	1	14	1,651 10
Little Miami Railway (under lease)	Included	in L. M.						
Pittsburgh and Lake Erie Railroad—Company	2,956 15	1,822 00	6,187 50	10,104 09	8	2	3	1 611 43
Rocky River Railroad—Company	755 57							
Scioto Valley Railway—Company	(a)							
	945 65	115 00	142 30	257 30	1	1	2	120 00

TABLE XVI.—LOSSES, DAMAGES, ETC., PAID—Continued.

Name, and how operated.	On goods and baggage.	For injuries in Ohio to—				For animals killed in Ohio.				
		Passengers.	Employees.	Others.	Total.	Horses.	Mules.	Cattle.	Sheep.	Hogs.
Springfield Southern Railroad—Company	\$175 00					1	2	10		17
St. Clairsville Northern Railway—Company	(a)									
St. Clairsville Railway—Company								1		
Toledo, Ann Arbor and Grand Trunk Railway—Company										
(from October 15)	47 60									
Toledo, Canada Southern and Detroit Railway (by C. S. Railway Company: stock ownership)		\$20 05		\$1,600 00	\$1,620 05	2		2		
Toledo, Delphos and Burlington Railroad—Company	266 55	(b)	(b)	(b)	151 16	(b)	(b)	(b)	(b)	(b)
Valley Railway—Company	37 27					1		4	10	
Wabash, St. Louis and Pacific Railway—Company	(a)									
Totals	\$163,931 85	\$32,859 78	\$43,383 21	\$22,638 92	(c) \$99,933 07	187	21	602	795	294
										\$27,009 19

(a) No losses or damages of any kind reported.

(b) Number not given.

(c) The T. D. &amp; B. reported only "total"; hence, this total is greater than sum of the three preceding columns.



TABLE XVII.—TRAIN MILEAGE AND FUEL.

Name, and how operated.	Passenger.	Freight.	Mixed.	Construction.	Total.	Fuel consumed.		
						Wood—Cords.	Coal—Tons.	Total cost.
Alliance and Lake Erie R. R.—Company	23,175	22,650	7,725		53,550	87	850	(a)
Baltimore and Ohio R. R. Co.—								
Central Ohio R. R. (under lease)	482,414	857,585			1,339,949	317	87,408	\$100,597 46
Newark, Somerset and Straitsville R. R. (under lease)	391,086	492,290		(b)	883,376	989	58,460	66,341 22
Sandusky, Mansfield and Newark R. R. (under lease)	54,696	104,985		(b)	159,681	183	10,738	12,213 41
Bellaire and Southwestern R'y—Company	232,473	603,047	(c)		835,520	945	47,837	55,658 60
Bowling Green R. R.—Company	27,544	27,142	28,552	15,600	98,838	52	1,260	1,836 00
Celina, Van Wert and State Line R'y—Company (till March 5; sold then to C. V. W. & M. R. Co.)	(d)					100	175	750 00
Chagrin Falls and Southern R. R.—Company (from February 1, 1881).	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Cincinnati and Eastern R'y—Company	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Cincinnati, Georgetown and Portsmouth R. R.—Company (from September 13, 1880)	38,227	3,697	56,923	(u)	98,747		1,451	5,867 16
Cincinnati, Hamilton and Dayton R. R.—Company	20,800		10,400	8,976	40,176			
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership)	315,741	167,517	240,390	25,141	748,789	82	584	1,256 00
Cincinnati, Richmond and Chicago R. R. (lease)	135,010	277,187	64,965	8,329	485,491	773	22,069	62,320 04
Dayton and Michigan R. R. (lease)	90,292	59,986	6,310		156,588	413	16,465	41,360 83
Cincinnati, Indianapolis, St. Louis and Chicago R'y—Company	324,570	407,746	172,752	40,034	944,902	601	650	16,072 74
Harrison Branch R. R. (under lease)	640,681	688,361	95,864	70,830	1,425,739	3,587	29,431	77,513 67
Cincinnati Northern R'y—Company	Included in C., L. & C.					1,000	83,000	198,561 01
Cincinnati and Portsmouth R. R.—Receiver (till September 13; sold to C., G. & P. R. Co.)			1,335	5,520	6,875	34	240	491 00
Cincinnati R. R. Co.	2,880		1,280		4,160	4	142	322 07
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to L. B. & W.)	537,691	688,645	43,860	71,390	1,341,606	598	3,575	128,257 02
Columbus, Springfield and Cincinnati R. R. (till May 1; leased to L. B. & W.)	333,375	208,806	89,536	21,946	673,663	1,171	16,275	38,871 18
Cincinnati, Sandusky and Cleveland R. R.—Company (by C. V. W. & M. C. Co., from March 5; construction contract)	Included in C., S. & C.							
Cincinnati and Westwood R. R.—Company	(d)					600		(a)
Cleveland, Columbus and Springfield R'y (under lease)	22,504	2,501,533			22,504		704	1,957 80
Cincinnati and Marietta R. R.—Company	1,113,450	242,653		54,000	3,668,983	4,732	182,344	322,995 50
Cleveland and Marietta R. R.—Company	337,701	2,602,600		8,484	608,848	810	22,546	47,248 93
Cleveland, Mt. Vernon and Delaware R. R.—Receiver	63,800	62,600	62,600	13,250	202,250	15	7,119	7,845 90
Cleveland, Painesville and Ashabula R. R.—Company	188,745	194,150		6,000	388,895	1,344	14,140	26,090 75
Cleveland, Tuscarawas Valley and Wheeling R'y—Company	Not reported.							
College Hill R. R.—Company (from May 1, 1881)	212,456	441,484		53,626	707,566	861	24,809	19,962 73
	(d)						500	1,750 00

TABLE XVII.—TRAIN MILEAGE AND FUEL—Continued.

Name, and how operated.	Passenger.	Freight.	Mixed.	Construction.	Total.	Fuel consumed.		
						Wood—Cords.	Coal—Tons.	Total cost.
Columbus and Hocking Valley R. R.—Company	153,376	659,571	60,442	6,895	850,284	1,285	25,597	\$82,244.62
Columbus and Maysville R'y.—Company	(d)	.....	.....	.....	.....	(a)	(a)	.....
Columbus and Toledo R. R.—Company	230,362	333,175	22,750	6,377	592,861	655	18,589	33,771.20
Columbus, Washington and Cincinnati R. R.—Receiver (till May 21)	.....	.....	14,600	.....	14,600	.....	238	643.67
Conotton Valley R'y.—Company	.....	.....	69,250	.....	69,250	.....	1,209	1,511.25
Dayton and Southeastern R. R.—Receiver (till May 21; then consolidated with T., D. & E. R.)	1,329	52,231	138,587	20,897	213,044	.....	7,880	9,950.12
Dayton and Union R. R.—Trustee	67,680	3,765	33,840	.....	105,285	153	2,563	6,381.44
Eastern Ohio R. R.—Lessee	(d)	.....	.....	.....	.....	(a)	200	(a)
Indiana, Bloomington and Western R'y Co.	.....	.....	.....	.....	.....	.....	(a)	.....
Cincinnati, Sandusky and Cleveland R. R. } Ohio Division (from May 1)	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati, Springfield and Cincinnati R. R. }	.....	.....	.....	.....	.....	.....	.....	.....
Iron R. R.—Company	132	25,201	21,362	946	47,641	.....	1,685	1,809.45
Lake Erie and Western R'y.—Company	503,318	655,792	54,454	54,454	1,213,564	1,141	51,713	116,101.92
Lake Shore and Michigan Southern R'y.—Company	2,694,364	7,262,957	.....	389,952	10,347,273	45,020	430,608	1,065,175.63
Chicago and Canada Southern R'y (by stock ownership and special agreement)	Included in L. S. & M. S.	.....	.....	.....	.....	127	.....	285.46
Mahoning Coal R. R. (under lease)	.....	.....	.....	.....	.....	.....	.....	.....
Marietta and Cincinnati R. R.—Receiver	795,200	1,592,900	314,400	51,000	2,753,500	932	81,803	136,951.00
Baltimore Short Line R'y (special agreement)	Included in M. & C.	.....	.....	.....	.....	.....	.....	.....
Cincinnati and Baltimore R'y (special agreement)	.....	.....	.....	.....	.....	.....	.....	.....
New York, Pennsylvania and Ohio R. R.—Company	1,318,973	4,265,060	1,427,152	119,124	7,130,309	11,857	232,064	494,402.41
Cleveland and Mahoning Valley R'y (under lease)	Included in N. Y. P.	.....	.....	.....	.....	.....	.....	.....
Ohio Central R. R.—Company	133,180	201,234	.....	25,868	360,282	225	15,001	17,982.54
Ohio and Mississippi R'y.—Receiver	1,250,683	2,185,766	.....	4,397	3,430,846	.....	165,174	223,839.05
Ohio and West Virginia R'y.—Company	63,079	44,929	.....	6,977	114,985	69	2,100	3,501.00
Painesville, Canton and Bridgeport N. G. R. R.—Company and Receiver (till February 1; sold to C. F. & S.)	(d)	.....	.....	.....	.....	(a)	(a)	(a)
Painesville and Youngstown R'y.—Company	38,170	26,582	34,835	.....	99,587	30	3,987	9,988.22
Paulding and Cecil R'y.—Company	(d)	.....	.....	.....	.....	(a)	(a)	(a)
Pennsylvania Company	.....	.....	.....	.....	.....	.....	.....	.....
Ashabua and Pittsburg R'y (under lease)	58,131	160,578	.....	998	219,707	305	6,255	11,750.88
Cleveland and Pittsburg R. R. (under lease)	547,333	1,746,426	(c)	69,324	2,363,083	5,761	59,588	89,706.27
Lawrence R. R. (under lease)	28,734	48,698	64,410	3,977	135,819	310	4,155	6,667.50
Massillon and Cleveland R. R. (under lease)	7,262	7,482	.....	210	14,990	25	210	332.60
North Western Ohio R'y (under lease)	121,722	245,000	.....	10,962	377,684	334	5,745	14,835.00
Pittsburg, Ft. Wayne and Chicago R'y (under lease)	1,633,013	5,773,221	1,768,638	366,604	9,761,536	16,366	213,312	404,026.29
Pittsburg, Cincinnati and St. Louis R'y.—Company	788,613	2,491,604	.....	98,618	3,381,835	3,084	140,002	135,251.18

Cincinnati and Muskingum Valley R'y (under lease).....	213,310	184,235	.....	2,360	399,905	423	13,538	19,429 24
Columbus, Chicago and Indiana Central R'y (under lease).....	1185,203	4,083,625	.....	133,573	5,413,401	10,029	174,273	442,494 64
Columbus and Xenia R. R. (under lease).....	Included	in "I. M.	.....	.....	.....	.....	.....	.....
Dayton and Western R. R.....	602,951	686,114	.....	.....	1,314,203	1,406	34,159	89,270 14
Little Miami R'y (under lease).....	266,281	331,056	239,139	.....	883,978	(a)	(a)	(a)
Pittsburgh and Lake Erie R. R.—Company.....	(b)	.....	.....	.....	.....	252	.....	861 81
Rocky River R. R.—Company.....	143,182	168,240	.....	24,679	336,101	247	10,293	15,733 54
Scioto Valley R'y—Company.....	79,752	57,857	51,620	22,729	211,958	101	4,709	6,723 86
Springfield Southern R. R.—Company.....	(c)	.....	.....	.....	.....	.....	.....	.....
St. Clairsville and Northern R'y—Company.....	21,910	16,800	.....	.....	38,710	28	226	257 25
St. Clairsville R'y—Company.....	29,990	28,620	.....	.....	57,710	367	3,487	10,591 53
Toledo, Ann Arbor and Grand Trunk R'y—Company (from October 15).....	224,275	218,250	466,679	21,239	930,443	(a)	(a)	(a)
Toledo, Canada Southern and Detroit R'y (by C. S. R'y Co.; stock ownership).....	167,129	111,990	(b)	(a)	279,119	2,216	5,056	17,384 29
Toledo, Delphos and Burlington R. R.—Company.....	45,158	30,421	.....	.....	75,579	.....	5,179	8,354 25
Valley Railway—Company.....	(d)	.....	.....	.....	.....	(a)	(a)	(a)
Wabash, St. Louis and Pacific R'y—Company.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals.....	19,242,209	41,750,304	5,550,332	1,923,966	68,475,811	122,536	2,327,834	\$4,655,093 68

(a) Not given.

(b) Not kept separately—included in others.

(c) Included in freight.

(d) No mileage account given.

(e) Road not operated.

TABLE XVIII.—CAR MILEAGE.

Name, and how operated.	Passengers.	Express and baggage.	Freight.		Caboose.	Construction, etc.	Total.
			Loaded.	Empty.			
Alliance & Lake Erie R. R.—Company	30,900	30,900	92,914	87,795	22,650		265,159
Baltimore & Ohio (I. R. Company)							
Balt. & Ohio & Chicago R. R. (stock ownership)	1,698,255	792,767	15,981,875	5,156,561	(a)	(b)	23,559,458
Central Ohio R. R. (under lease)	1,010,092	591,806	8,462,971	2,433,581	(a)	(b)	12,521,252
Newark, Somerset & Stratsfle R. R. (under lease)	113,066	431	1,156,017	991,354	(a)	(b)	2,262,827
Sandusky, Maunsfield & Newark R. R. (under lease)	738,894	431,156	8,725,959	3,478,002	(a)		13,374,011
Bellaire & Southwestern R'y—Company	79,716	26,292	105,168	55,056	6,820	9,214	262,265
Bowling Green R. R.—Company	(c)						
Celina, Van Wert and State Line R'y—Co. (till March 5; sold then to C., V. W. & M. R. Co.)							
Chagrin Falls & South R. R.—Co. (from Feb. 1, '81)	6,200	70,056	5,530	(d)			11,730
Cincinnati & Eastern R'y—Company	93,891		137,119	69,123	(a)	(a)	370,189
Cincinnati, Georgetown & Portsmouth R. R.—Company (from Sept. 13, 1880)							
Cincinnati, Hamilton & Dayton R. R.—Company	45,213	1,440	(b)	(b)	(b)	(b)	46,653
Cin., Ham. & Indianapolis R.R. (stock ownership)	1,265,187	390,620	3,537,051	814,212	147,203		6,193,273
Cincinnati, Richmond & Chicago R. R. (lease)	303,561	125,805	2,484,240	703,807	190,932		3,808,345
Dayton & Michigan R. R. (lease)	238,232	68,300	823,450	208,976	58,029		1,396,987
Cin., Indianapolis, St. Louis & Chicago R'y—Co.	873,767	310,476	7,319,456	1,882,182	372,539		10,758,700
Harrison Branch R. R. (under lease)	2,178,006	1,007,104	12,629,307	4,071,916	765,733		20,652,065
Cincinnati Northern R'y—Company							
Cincinnati & Portsmouth R. R.—Receiver (till Sept. 13; sold to C., G. & P. R. Co.)	1,355	1,355	3,500	2,700		41,000	52,910
Cincinnati R. R. Co.	7,076	2,480	(b)	(b)	(b)	(b)	9,556
Cincinnati Southern R'y (under license)	1,646,934	771,453	10,791,268	2,553,214	732,525	585,076	17,100,470
Cin., Sandusky & Cleveland R. R.—Company (till May 1; leased to I. B. & W.)							
Cin., Van Wert & Chicago R. R. (till May 1; leased to I. B. & W.)							
Columbus, Springfield & Cin. R. R. (by C., V. W. & M. C. C. Co. from March 5; construction contract)	927,205	(c)	2,833,654	1,241,173	191,700		5,266,741
Cincinnati & Westwood R. R.—Company							
Cleveland, Columbus, Cin. & Indianapolis R'y—Co.	22,504	(d)	(c)	(c)	(c)	(d)	22,404
Cincinnati & Springfield R'y (under lease)	3,653,485	1,801,619	39,834,329	18,715,849	2,359,187	459,815	66,454,584
Cleveland & Marietta R. R.—Company	1,012,337	441,385	5,040,263	2,371,889	307,719	12,912	9,186,660
Cleveland, Mt. Vernon & Delaware R. R.—Receiver	187,200	93,000	577,500	288,900	70,430		1,223,630
Cleveland, Fairview & Ashland R. R.—Co.	627,576	289,771	1,592,868	503,752	196,350	8,240	3,218,555
Cleveland, Tuscarawas Valley & Wheeling R'y—Co.	424,912	212,456	7,380,008	3,690,033	441,184	1,179,772	13,928,723
College Hill R. R.—Company (from May 1, 1881)	(c)						
Columbus & Hocking Valley R. R.—Company	391,073	140,875	7,803,091	5,202,062	515,729	41,170	14,091,603
Columbus & Maysville R'y—Company	(c)						
Columbus & Toledo R. R.—Company	492,119	216,832	6,881,582	1,376,316	330,090	36,000	9,332,939
Columbus, Wash'ton & Cin. R. R.—Receiver (till May 21)	(c)						
Corrington Valley R'y—Company	81,618	56,900	151,983	349,158			642,259

Dayton & Southern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.)	237,020	75,953	1,301,990	907,570	88,564	2,811,097
Dayton & Union R. R.—Trustee	175,720	36,598	242,490	141,703		696,511
Eastern Ohio R. R.—Lessee	(c)					
Indiana, Bloomington & Western R'y Co.	(c)					
Cin., Sandusky & Cleve. R. R. } Ohio Div. (from May 1)	18,229					
Col., Springfield & Cin. R. R.						
Iron R. R.—Company						
Lake Erie & Western R'y—Company	1,083,063	536,532	176,272	120,282		314,783
Lake Shore & Mich. Southern R'y—Company	10,188,326	6,137,292	6,547,063	1,877,402	435,632	10,465,122
Chicago & Canada Southern R'y (by stock ownership and special agreement)			222,134,000	44,426,800	9,748,800	301,346,578
Maioning Coal R. R. (under lease)	Included in					
Marietta & Cincinnati R. R.—Receiver	1,962,442	L. S. & M. S.	14,562,751	5,092,565		22,483,158
Baltimore Short Line R'y (special agreement)	Included in	L. S. & M. S.				
Cincinnati & Baltimore R'y (special agreement)	Included in	M. & C.				
New York, Pennsylvania & Ohio R. R.—Company	4,947,762	M. & C.	50,639,758	16,075,007	310,247	77,273,691
(Cleveland & Mahoning Valley R'y (under lease))	Included in	N. Y. P. & O.				
Ohio Central R. R.—Company	237,547	129,538	2,510,339	1,931,555	564,731	5,575,051
Ohio & Mississippi R'y—Receiver	4,593,657		28,809,615	9,035,215	26,382	45,220,665
Ohio & West Virginia R'y—Company	103,602	49,833	231,766	69,000	40,000	524,183
Painesville, Canton & Bridgeport N. G. R. R.—Company and Receiver (till Feb. 1; sold C. F. & S.)	(c)					
Painesville & Youngstown R'y—Company	70,292	76,785	424,436	33,172	672	914,266
Pennsylvania Company	(c)					
Astabula & Pitsburgh R'y (under lease)	105,898	39,980	1,667,334	450,469	89,827	2,373,718
Cleveland & Pitsburgh R. R. (under lease)	1,232,508	737,490	16,678,053	5,851,138	1,144,998	26,388,449
Lawrence R. R. (under lease)	47,699	26,879	795,980	298,090	39,237	1,207,885
Massillon & Cleveland R. R. (under lease)	11,938	6,965	17,182	13,788	4,818	54,721
North Western Ohio R'y (under lease)	221,759	122,264	1,632,097	353,851	2,446,309	
Pittsburgh, Ft. Wayne & Chicago R'y (under lease)	7,441,954	3,805,537	90,904,014	15,484,340	113,358	123,325,751
Pittsburgh, Cincinnati & St. Louis R'y—Company	2,532,128	1,983,560	37,520,257	6,094,927	394,472	50,626,381
Cincinnati & Muskegon Valley R'y (under lease)	438,627	162,130	1,686,161	734,938	9,440	3,130,703
Columbus, Chicago & Indiana Central R'y (under lease)	3,306,562	1,800,738	45,495,006	12,030,696	558,292	66,272,202
(Columbus & Xenia R. R. (under lease))	Included in	L. M.				
Dayton & Western R. R.	Included in	L. M.				
Little Miami R'y (under lease)	1,596,772	939,783	7,225,578	1,816,971	100,552	12,039,152
Pittsburgh & Lake Erie R. R.—Company	684,193	58,227	5,535,567	2,441,985	314,611	9,064,613
Rocky River R. R.—Company	(c)					
Soldot Valley R'y—Company	444,224	137,349	1,189,030	438,070	172,753	2,503,308
Springfield Southern R. R.—Company	107,346	(c)	401,999	678,920	89,604	1,343,162
St. Clairsville and Northern R'y—Company	(g)					
St. Clairsville R'y—Company	21,910		12,600	4,200		38,710
Toledo, Ann Arbor & Grand Trunk R'y—Co. (from October 15)	72,750	61,293	142,719	83,409		362,171
Toledo, Can. South'n & Detroit R'y (by C. S. R'y Co.; st'k ownership)	770,269	191,688	6,475,778	(d)	200,407	7,898,792
Toledo, Delphos & Burlington R. R.—Company	983,288	131,881	828,052	425,628	(b)	1,948,860
Valley Railway—Company	136,764	45,138	450,993	(d)	30,421	665,338
Wabash, St. Louis & Pacific R'y—Company	(c)					
Totals	61,234,002	27,739,310	690,786,974	181,703,123	16,225,230	1,015,221,579

(a) Not given. (b) Not kept. (c) No mileage account kept. (d) Included in loaded. (e) Included in passenger. (f) Included in empty freight. (g) Not in operation.

TABLE XIX.—PASSENGERS.

Name, and how operated.	Number carried.			Miles traveled.		Average received.	
	Local.	Through.	Total.	Total.	Average.	For each.	Per mile.
Alliance and Lake Erie R. R.—Company	19,831	1,310	21,141	204,715	9.70	Cents. 29.50	Cents. 3.04
Baltimore and Ohio R. R. Co.	(a)	(a)	224,409	19,119,647	85.20	150.00	1.76
Baltimore and Ohio and Chicago R. R. (stock ownership)	(a)	(a)	320,401	15,718,873	49.06	91.50	1.86
Central Ohio R. R. (under lease)	(a)	(a)	42,356	868,298	20.50	55.80	2.72
Newark, Somerset and Stratfordville R. R. (under lease)	(a)	(a)	224,470	9,007,316	42.80	88.80	2.08
Sandusky, Mansfield and Newark R. R. (under lease)	36,803	4,177	40,980	607,140	11.62	44.47	3.00
Belleaire and Southwestern R'y.—Company			20,000	110,000	5.50	25.00	4.54
Bowling Green R. R.—Company							
Chelan, an Wert and State Line R'y.—Company (till March 5; sold then to C., V. W. & M. R. Co.)	256	4,276	4,532	22,241	4.30	23.80	4.55
Chagrin Falls and Southern R. R.—Company (from February 1, 1881)			85,109	(a)			
Cincinnati and Eastern R'y.—Company			31,553	347,083	11.00	28.60	2.05
Cincinnati, Georgetown and Portsmouth R. R.—Company (from Sept. 13, 1880)	922,305	112,317	1,034,682	20,470,760	19.78	38.46	1.05
Cincinnati, Hamilton and Dayton R. R.—Company	151,470	6,712	158,182	3,461,329	21.88	72.80	3.33
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership)	99,273	22,859	122,132	3,107,040	28.50	68.50	2.42
Dayton and Michigan R. R. (lease)	392,673	19,543	412,216	12,349,601	29.46	75.38	2.55
Cincinnati and Michigan R. R. (lease)	609,720	147,187	756,907	29,444,812	38.90	99.00	2.55
Harrison Branch R. R. (under lease)			R'y.	37,320	16.00	47.00	3.00
Cincinnati Northern R'y.—Company	2,270		7,241	116,716	16.12	40.29	2.50
Cincinnati and Portsmouth R. R.—Receiver (till September 13; sold to C. G. & P. R. R. Co.)	359,971	16,316	376,287	19,372,298	52.00	114.00	2.20
Cincinnati R. R. Co.							
(Cincinnati Southern R'y (under license)							
I. B. & W.)							
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to Columbus, Springfield and Cincinnati R. R. (till May 1; leased to I. B. & W.)	232,307	42,551	274,858	8,585,437	31.24	79.41	2.54
(Cincinnati, Van Wert and Michigan R. R. (by C., V. W. & M. R. Co. from March 5; construction contract)	Included in C.	S. & C.					
Cincinnati and Westwood R. R.—Company	(a)						
Cincinnati, Columbus, Cincinnati and Indianapolis R'y.—Company	768,121	91,986	858,107	40,255,350	47.00	101.00	2.14
Cincinnati and Marietta R. R.—Company	432,954	87,971	520,925	14,043,804	27.00	57.10	2.12
Cleveland and Marietta R. R.—Company	(a)		83,437	(a)			2.30
Cleveland, Mt. Vernon and Delaware R. R.—Receiver	212,085	13,853	225,938	5,083,126	22.50	59.20	2.63
Cleveland, Painesville and Ashland R. R.—Company	Not reported.						
Cleveland, T有所aras Valley and Wheeling R'y.—Company	179,443	55,875	215,278	4,548,401	21.12	55.11	2.61
College Hill R. R.—Company (from May 1, 1881)	(a)						
Columbus and Hocking Valley R. R.—Company	239,738	2,537	242,275	5,795,490	23.92	48.90	2.04
Columbus and Mayville R'y.—Company	1,804	18	1,822				2.25
Columbus and Toledo R. R.—Company	191,648	16,276	207,924	6,843,776	32.66	78.15	2.38
Columbus, Washington and Cincinnati R. R.—Receiver (till May 21)	(a)		2,892	48,740	7.89	15.32	1.96
Conotton Valley R'y.—Company	53,154	807	53,961	783,003	14.48	40.40	2.90
Dayton and Southern R. R.—Receiver (till May 21; then consolidated with T., D. & E. R. R.)	(a)	(a)	84,096	1,715,574	20.50	41.50	2.18



	87,898 (a)	16,323	103,721	2,355,847	22,71	58,33	257
Dayton and Union R. R.—Trustee.....							
Eastern Ohio R. R.—Lessee.....							
Indiana, Bloomington and Western R. Co.— (Cincinnati, Sandusky and Cleveland R. R. } Ohio Division (from May 1)	(a)						
Iron R. R.—Company.....	34,041	8,587	42,628	426,280	10.00	27.00	2.70
Lake Erie and Western R'y—Company.....	318,146	25,355	343,501	10,432,564	31.53	94.17	2.98
Lake Shore and Michigan Southern R'y—Company.....	3,227,788	97,679	3,325,467	188,693,821	57.00	117.00	2.06
(Chicago and Canada Southern R'y (by stock ownership and special agreement).....	(a)	(a)	43,168	545,763	12.50	34.50	2.75
Mahoning Coal R. R. (under lease).....	Included in L.	S. & M. S. R'y.					
Marietta and Cincinnati R. R.—Receiver.....	69,731	47,519	743,250	(a)			
Baltimore Short Line R'y (special agreement).....	Included in M.	& C.					
Cincinnati and Baltimore R'y (special agreement).....	1,149,162		1,364,502	58,112,263	42.60	85.30	2.03
New York, Pennsylvania and Ohio R. R.—Company.....	Included in M.	& C.					
Cleveland and Mahoning Valley R'y (under lease).....	Included in N.	Y. P. & O.					
Ohio (Central R. R.—Company).....	66,629		66,629	1,321,961	19.84	53.38	2.09
Ohio and Mississippi R'y—Receiver.....	788,514	96,817	885,331	52,864,587	59.77	140.59	2.35
Ohio and West Virginia R'y—Company.....	68,688	1,986	70,674	1,684,498	23.80	60.30	2.53
Painesville, Canton and Bridgeport N. G. R. R.—Company and Receiver (all February 1, sold to C., F. & S.).....							
Painesville and Youngstown R'y—Company.....	(a)						
Paulding and Cecil R'y—Company.....	35,570	414	35,984	630,578	17.52	48.71	2.78
Pennsylvania Company— Ashtabula and Pittsburgh R'y (under lease).....	77,028		77,028	1,113,324	14.40	38.40	2.60
Cleveland and Pittsburgh R. R. (under lease).....	797,232	39,204	836,436	18,383,758	22.00	57.00	2.60
Lawrence R. R. (under lease).....	37,690		37,690	400,106	12.20	33.90	2.70
Massillon and Cleveland R. R. (under lease).....	5,432		5,432	47,657	8.70	26.10	2.90
North Western Ohio R'y (under lease).....	105,271		105,271	2,470,693	23.40	60.80	2.50
Pittsburgh, Ft. Wayne and Chicago R'y (under lease).....	2,488,907	169,558	2,658,465	111,628,798	41.90	87.40	2.00
Pittsburgh, Cincinnati and St. Louis R'y—Company.....	810,877	104,173	915,050	30,436,422	39.82	94.49	2.67
Cincinnati and Muskingum Valley R'y (under lease).....	210,713	7,292	217,915	4,439,463	20.37	54.34	2.37
Columbus, Chicago and Indiana (Central R'y (under lease).....	693,467	115,318	808,785	42,013,686	51.95	124.47	2.39
Columbus and Xenia R. R. (under lease).....	Included in L.	M.					
Little Miami R'y (under lease).....	811,041	110,163	921,204	22,600,391	24.53	54.35	2.92
Pittsburgh and Lake Erie R. R.—Company.....	(a)	(a)	346,490	6,236,823	18.00	47.70	2.55
Rocky River R. R.—Company.....	22,584		22,584	(a)	(a)	(a)	(a)
Scioto Valley R'y—Company.....	164,155	16,416	180,571	5,530,880	30.63	74.00	2.41
Springfield Southern R. R.—Company.....	30,360		30,360	1,290,300	42.50	107.00	2.53
St. Charlesville Northern R'y—Company.....	None.						
St. Charlesville R'y—Company.....	3,495	12,451	15,946	103,649	4.10	22.50	3.50
Toledo, Ann Arbor and Grand Trunk R'y—Company (from October 15).....	32,652	8,015	40,667	1,372,678	34.00	98.00	1.63
Toledo, Canada Southern and Detroit R'y (by C., S. R'y Co.; stock owner- ship).....							
Toledo, Delphos and Burlington R. R.—Company.....	(a)		160,240	5,127,680	32.00	73.60	2.30
Valley Railway—Company.....	138,197	14,998	153,195	2,467,718	21.00	57.60	2.75
Wabash, St. Louis and Pacific R'y—Company.....	(a)	(a)	1,497,329	3,000,343	23.99	57.60	2.40
Totals.....	17,805,663	1,752,419	22,558,082	920,108,052	48.40	107.00	2.28

(a) Not given.

TABLE XX.—FREIGHT TONNAGE.

Name, and how operated.	Yielding revenue.			Total movement, or tons moved 1 mile.	Average received.		Average cost.	
	Local.	Through.	Total.		For each ton.		Per ton.	
					Tons.	Tons.	Cts.	Cts.
Alliance and Lake Erie Railroad—Company Baltimore and Ohio Railroad Company— Central Ohio Railroad (under lease) Newark, Somerset and Strutsville Railroad (under lease) Sandusky, Mansfield and Newark Railroad (under lease) Bellare and Southwestern Railway—Company Bowling Green Railroad—Company Cal. Van Wert & S. L. R'y—Co. (till Mar. 5; sold then to C. V. W. & M. R. R. Co.) Chagria Falls and Southern Railroad—Company (from February 1, 1881) Cincinnati, Georgetown and Portsmouth Railroad—Co. (from Sept. 13, 1880) Cincinnati, Hamilton and Dayton Railroad—Company Cincinnati, Richmond and Indianapolis Railroad (stock ownership) Dayton and Michigan Railroad (lease) Harrison Branch Railroad (under lease) Cincinnati Northern Railway—Company Cin. and Portsmouth R. R.—Receiver (till Sept. 13; sold to C. G. & P. R. R. Co.) Cincinnati R. R. Co. Cincinnati Southern Railway (under license) Cincinnati, Sandusky & Cleveland R. R.—Co. (till May 1; leased to I. B. & W.) Col. Springfield and Cincinnati Railroad (till May 1; leased to I. B. & W.) Cin., Van Wert & Mich. R. R. (C. V. W. & M. C. Co. from Mar. 5; constr'n contr'd) Cincinnati and Westwood Railroad—Company Cleveland, Columbus, Cinc. & Indianapolis R'y—Co. Cincinnati and Springfield Railway (under lease) Cleveland and Marietta Railroad—Company Cleveland, Mt. Vernon and Delaware R. R.—Receiver Cleveland, Painesville and Ashabula Railroad—Co. College Hill Railroad—Company (from May 1, 1881) Columbus and Hocking Valley Railway—Company Columbus and Maysville Railway—Company Columbus and Toledo Railroad—Company Columbus, Washington, and Cincinnati Railroad—Receiver (till May 21)	4,786 123,309 55,261 47,207 40,889 4,500 (a) (a) (a) 26,001 677,893 277,541 79,064 621,363 300,105 (e) 429,224 (a)							

	37,505	14,087	51,592	914,177	(a)	(n)	3,20	(a)	(a)	(a)
Connotton Valley Railway—Company	(a)	145,393	145,393	9,206,291	(a)	104,00	1.52	(a)	72.00	1.14
Day, & S.—Eastern R. R.—Rec. (till May 21; then consol. with T. P. & E. R. R.)	(a)	22,019	72,535	2,300,711	(a)	85.82	2.45	(a)	(a)	(a)
Eastern Ohio R. R.—Lessee	(a)	(a)	4,146	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Indiana, Bloomington, and Western Railway Co.	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Cincinnati, Springfield and Cincinnati Railroad, (Ohio Div. (from May 1), Columbus, Springfield and Cincinnati Railroad, (Ohio Div. (from May 1),										
Iron Railroad—Company	149,803	44,497	194,300	1,043,000	(a)	(a)	4.16	(a)	(a)	3.25
Lake Erie and Western Railway—Company	555,694	130,898	675,692	92,168,282	(a)	(a)	1.00	(a)	(a)	(a)
Lake shore and Michigan Southern Railway—Co.	7,505,712	1,092,050	8,687,762	1,907,071,353	(a)	316.20	132.20	7.71	(a)	3.17
Chi. and Cav. Southern R. R. (by stock ownership and special agreement)	56,049	(d)	60,029	1,093,477	(a)	(a)	3.22	(a)	(a)	(a)
Maumee and C. Railroad—Lessee	Incl. in M. & C.	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Marion and Cincinnati Railroad—Receiver	600,585	133,332	1,132,147	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Eastern Shore Line Railway (special agreement)	Incl. in M. & C.	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Cincinnati and Baltimore Railroad (special agreement)	Incl. in M. & C.	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
New York, Pennsylvania and Ohio Railroad—Co.	27,28,093	1,920,141	4,619,131	512,564,236	(a)	139.10	56.70	7.77	(a)	56
Cleveland and Mahoning Valley Railway (under lease)	Incl. in N. Y. P. & O.	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)
Ohio Central Railroad—Company	217,732	(a)	217,732	29,041,085	(a)	109.97	.91	(a)	73.10	.62
Ohio and Mississippi Railway—Receiver	858,628	685,131	1,558,759	282,875,316	(a)	74.90	2.48	(a)	(a)	1.04
Ohio and West Virginia Railway—Company	71,831	1,321	73,152	2,233,280	(a)	(a)	(a)	(a)	(a)	(a)
Painesville, Can. & P. N. G. R.—Co. & Rec. (till Feb. 1; sold to C. F. & S.)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Painesville and Youngstown Railway—Company	18,540	4,323	60,463	3,458,362	(a)	100.97	1.56	(a)	(a)	(a)
Paulding and Cecil Railway—Company	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Pennsylvania Company										
Ashtabula and Pittsburgh Railway (under lease)	482,318	(d)	482,318	21,734,079	(d)	55.12	1.22	(a)	28.09	.62
Cleveland and Pittsburgh Railroad (under lease)	1,302,031	695,359	2,195,390	100,150,360	(d)	88.00	1.21	52.00	5.160	.59
Lawrence Railroad (under lease)	709,672	(d)	709,672	10,434,384	(d)	23.66	1.61	(a)	(a)	73
Massillon and Cleveland R. R. (under lease)	27,387	(d)	27,387	95,348	(d)	30.13	8.81	(d)	(a)	1.34
North Western Ohio Railway (under lease)	168,073	79,463	217,536	16,910,545	(a)	80.08	1.04	(a)	(a)	.84
Pittsburgh, Fort Wayne and Chicago Railway (under lease)	2,691,328	1,554,216	4,245,544	958,843,069	(a)	116.00	.85	(a)	(a)	.46
Pittsburgh, Cincinnati and St. Louis Railway—Co.	1,809,265	1,899,897	3,709,163	397,093,949	(a)	78.74	.81	(a)	(a)	.47
Cincinnati and Muskingum Valley Railway (under lease)	190,881	90,168	281,051	387,181,028	(a)	62.58	1.56	(a)	(a)	1.28
Columbus, Chicago and Indiana Central Railway (under lease)	1,136,492	1,589,371	2,725,863	490,561,211	(a)	132.47	132.89	.76	(a)	.69
Columbus and Xenia Railroad (under lease)	Incl. in L. M.	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Little Miami Railway (under lease)	418,439	378,010	826,449	66,000,931	(a)	97.03	1.20	(a)	(a)	.93
Pittsburgh and Lake Erie Railroad—Company	422,585	873,245	1,295,830	69,246,507	(a)	69.73	1.01	(a)	(a)	.76
Rocky River R. R.—Company	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)
Scioto Valley R. R.—Company	187,985	33,247	220,532	11,736,570	(a)	91.04	1.39	(a)	(a)	1.10
Springfield Southern Railroad—Company	91,987	(a)	91,987	7,118,512	(a)	(a)	(a)	(a)	(a)	(a)
St. Clairsville and Northern R. V.—Company	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)
St. Clairsville R. V.—Company	4,024	550	4,574	25,875	(a)	37.50	5.50	20.00	3.50	3.50
Toledo, Ann Arbor and Grand Trunk R. V.—Company (from October 15),	25,586	1,182	40,768	1,255,060	(a)	110.00	3.15	(a)	(a)	(a)
Toledo, Cuyahoga Southern & Detroit R. V. (by C. S. R. V. Co. stock ownership)	94,388	1,893,179	1,893,167	63,661,147	(a)	222.90	.51	(a)	(a)	3.10
Toledo, Dalphos and Burlington R. R.—Company	(d)	(a)	119,443	4,765,718	(a)	2.73	(a)	(a)	(a)	(a)
Valley Railway—Company	143,721	4,444	186,168	6,165,594	(a)	98.30	2.02	(a)	(a)	1.02
Wauash, St. Louis and Pacific R. V.—Company	(a)	(a)	4,888,769	1,118,231,413	(a)	(a)	.89	(a)	(a)	(a)
Totals	29,531,288	20,440,250	(b) 55,279,369	7,697,215,616			.915			

(a) Not given. (b) Estimated by a comparison with the report of 1880. (c) Not known. (d) None. (e) Not given; but construction transportation carried on. (f) From report of 1880. (g) Has no freight. (h) This total is greater than the sum of the two preceding columns, owing to some companies giving only totals.



	49	914	3,802	119	12,819	22,379
Dayton & Southeast'n R. R.—Rec'r (till May 21; then consol'd with T. D. & E. R. R.).	1,814			65	75	800
Dayton and Union Railroad—Trustee	900					
Eastern Ohio Railroad—Lessee						
Indiana, Bloomington and Western Railway Company—						
Cincinnati, Sandusky and Cleveland Railroad (Ohio Division (from May 1).)						
Columbus, Springfield and Cincinnati Railroad						
Iron Railroad—Company						
Lake Erie and Western Railway—Company	73,854	68,773	15,713	293	1,792	2,958
Lake Shore and Michigan Southern Railway—Company	41,241			(f) 1,420	105,660	360,140
Lake Shore and Canada Southern R'y (by stock ownership and special agreement).	1,441,563	140,964	223,814	471,290	895,796	2,379,484
Chicago and Grand Rapids Railroad—Company	380				23,649	11,545
Marquette and Ontonagon Railroad—Receiver	In L. S. & M. S. R'y					
Baltimore and Annapolis Railroad—Receiver	119,234	40,680	62,877	11,845	20,429	530,317
Cincinnati and Baltimore Railroad (special agreement)	In M. & C. R. R.					
New York, Pennsylvania and Ohio Railroad—Company	In M. & C. R. R.	510,156	199,371	290,543	233,043	614,735
Cleveland and Mahoning Valley Railway (under lease)	1,222,424	309,192	121,832			
Ohio Central Railroad—Company	In N. Y. P. & O. R.	296	2,573	1,357	28,430	10,883
Ohio and Mississippi Railway—Receiver	183,553	8,136				
Ohio and West Virginia Railway—Company		46,138	2,624		6,372	1,037
Palmer, Canton & Bridgeport N. G. R. R.—Company and Receiver (till Feb'y 1; sold to C. F. & S.)	91					
Pathville and Youngstown Railway—Company	96	50,918	230	209	7,528	851
Paulding and Cecil Railway—Company						
Pennsylvania Company—						
Ashtabula and Pittsburgh Railway (under lease)	200,655	196,218	15,168	7,264	16,232	3,331
Cleveland and Pittsburgh Railroad (under lease)	1,053,079	335,222	93,871	65,672	89,174	65,015
Lawrence Railroad (under lease)	370,227	163,113	29,275	14,551	3,886	2,379
Massillon and Cleveland Railroad (under lease)	15,119	6	26	22	282	1,658
North Western Ohio Railway (under lease)	33,773	14,771	2,508	6,281	57,315	82,452
Pittsburgh, Ft. Wayne and Chicago Railway (under lease)	1,327,334	43,019	173,328	210,920	270,849	692,985
Pittsburgh, Cincinnati and St. Louis Railway—Company	1,307,046	60,540	43,216	115,626	97,876	710,132
Cincinnati and Muskingum Valley Railway (under lease)	79,941	17,988	9,085	7,594	18,789	67,886
Columbus, Chicago and Indiana Central Railway (under lease)	558,012	36,220	16,209	83,988	227,429	866,981
Columbus and Xenia Railroad (under lease)	In L. M. R'y.	27,337				
Little Miami Railway (under lease)	165,237	993	11,832	34,813	107,963	153,269
Pittsburgh and Lake Erie Railroad—Company	602,398	931	54,853	141,302	20,038	13,923
Rocky River Railroad—Company						
Sandusky and Toledo Railroad—Company	59,463	4,374	14,005	11,222	49,461	63,154
Springfield Southern Railroad—Company		1,209	2,582		16,898	5,606
St. Charles and Northern Railway—Trustees	None					
St. Charles Railway—Company	1,024					
St. Charles and Grand Trunk Railway—Company (from October 15)	11,556		1,804	346	14,524	6,321
Toledo, Ann Arbor and Grand Trunk Railway—Company (from October 15)	226,181	6,851	36,384	90,302	152,649	871,181
Toledo, Cuyahoga Southern and Detroit R'y (by C. S. R'y Co.; stock ownership)	11,249	9,271	18,955	3,701	80,352	24,065
Toledo, Delphos and Burlington Railroad—Company	85,542	5,815	1,297	3,373	17,943	16,796
Valley Railway—Company	540,055	87,198	20,482	182,080	587,943	2,058,596
Wabash, St. Louis and Pacific Railway—Company						
Totals	14,122,835	1,963,786	2,370,233	1,927,641	4,698,322	12,737,394

(d) Includes manufactured iron.  
(e) Includes pig and bloom iron.  
(f) Includes coke.

(d) Not kept.  
(e) Not reported.  
(f) No classification kept.

TABLE XXI.—TONNAGE CLASSIFIED—Continued.

Name and how operated.	Live stock.	Animal products.	Manufactures, including agricultural implements.	Merchandise.	Miscellaneous.	Total farm and revenue.	Supplies for company's use.
Alliance and Lake Erie R. R.—Company		196	274	234	18	61,014	892
Baltimore and Ohio R. R.—Co.							
Central Ohio R. R. (stock ownership)	41,297	41,758	25,972	26,490	182,995	750,450	(a)
Newark, Somerset and Stratfield R. R. (under lease)	25,078	42,791	11,979	55,168	125,696	707,082	(a)
Sandusky, Mansfield and Newark R. R. (under lease)	1,901	48	1,926	1,926	3,067	218,513	(a)
Bellair and Southwestern R'y—Company	23,115	44,847	13,053	7,511	122,968	877,217	(a)
Bowling Green R. R.—Company	(c)						
Celina, Van Wert and State Line R'y—Company (till March 5; sold then to C., V. W. & M. R. Co.)	(b)						
Chugra Falls and Southern R. R.—Company (from February 1, 1881)							
Cincinnati and Eastern R'y—Company					2,557	1,186	(a)
Cincinnati (Georgetown and Port Smith R. R.—Company (from September 13, 1880)	(c)						(a)
Cincinnati, Hamilton and Dayton R. R.—Company	53,701	25,630	27,736	150,119	10,128	469,570	14,730
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership)	26,462	5,353	10,699	50,363	1,366	347,237	27,301
Cincinnati, Richmond and Chicago R. R. (lease)	19,156	5,969	5,661	38,597	715	197,353	294
Dayton and Michigan R. R. (lease)	18,149	8,639	13,652	106,382	8,866	763,198	23,668
Cincinnati, Indianapolis, St. Louis and Chicago R'y—Company	82,047	16,900	87,146	31,311	142,051	1,255,999	
Harrison Branch R. R. (under lease)	Included in C., L. & C.						
Cincinnati Northern R'y—Company	(b)						
Cincinnati and Portsmouth R. R.—Receiver (till Sept. 13; sold to C., G. & P. R. R. Co.)	58,175	26,960	18,347	10,668	79,828	627,597	5,915
Cincinnati R. R. Co.			12	4	8	279	
Cincinnati Southern R'y (under lease)							
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to L. B. & W.)	(b)						
Columbus, Springfield and Cincinnati R. R. (till May 1; leased to L. B. & W.)	(b)						
Cincinnati, Van Wert and Michigan R. R. (by C., V. & M. C. Co., from March 5; construction contract)							
Cincinnati and Westwood R. R.—Company	(c)						
Cleveland, Columbus, Cincinnati and Indianapolis R'y—Company	No freight.						
Cincinnati and Springfield R'y (under lease)	179,532	71,588	116,143	5,924	26,040	260,463	219,096
Cincinnati and Marietta R. R.—Company	41,192	21,115	96,352	306,002	978,363	978,363	20,363
Cleveland, Mt. Vernon and Delaware R. R.—Receiver	5,922	675	3,337	10,275	1,556	152,085	1,164
Cleveland, Painesville and Ashland R. R.—Company	10,652	4,324	52,049	16,716	5,630	312,918	7,080
Cleveland, Tinseltown and Wheeling R'y—Company	6,000 ft.						
College Hill R. R.—Company (from May 1, 1881)	2,161		26,802	10,692	17,872	903,919	75,013
Columbus and Hooking Valley R. R.—Company	(c)						
Columbus and Massville R'y—Company	1,768						
Columbus and Toledo R. R.—Company			15	118	72,965	1,617,887	(c) 40,000
Columbus, Washington and Cincinnati R. R.—Receiver (till May 21)	6,678	6,909			37,498	665,053	(c) 8,000
	None reported.						



Connotton Valley R'y.—Company	7,156	30	113	1,007	708	52,054	1,946
Dayton and Southern R. R.—Receiver (till May 21; then consold with T. V. & B. R. R.)	1,065	91	736	14,067	41	115,386	5,389
Eastern Ohio R. R.—Lessee					890	4,146	
Indiana, Bloomington and Western R'y.—Company							
Columbus, Strasburg and Cleveland R. R. (Ohio Division (from May 1))	(c)	315	927	1,017			
Lake Erie and Western R'y.—Company	28,287				1,399	194,300	524
Lake Shore and Michigan Southern R'y.—Company	560,061	b) 284,166	337,354	676,311	121,220	675,592	
Chicago and Canada Southern R'y (by stock ownership and special agreement)	3,030	822	2,040	822	67,224	8,087,762	500,086
Mahoning Coal R. R. (under lease)	Included in L. S. & M. S. R'y.			1,801	11,400	56,029	1,412
Market and Cincinnati R. R.—Receiver	48,969	29,776	26,045	92,075	137,316	1,132,147	
Baltimore Short Line R'y (special agreement)	Included in M. & C. R. R.						
Cincinnati and Baltimore R'y (special agreement)	62,874	159,337	63,968	334,706	191,229	4,313,411	335,723
New York, Pennsylvania and Ohio R. R.—Company	Included in N. Y., P. & O. R. R.				4,060	247,752	29,476
Cleveland and Mahoning Valley R'y (under lease)	665	108	3,117	3,386			
Ohio Central R. R.—Company	(c)	5,217			4,236	73,152	
Ohio and West Virginia R'y.—Company							
Palmer, Canton and Bridgeport N. G. R. R.—Company and Receiver (till February 1; sold to C. F. & S. Youngstown R'y.—Company)	435						
Palmer, Canton and Bridgeport N. G. R. R.—Company	(b)	20					
Painesville and Youngstown R'y.—Company	(c)	1,267	555	880	1,178	6,863	4,445
Pennsylvania Company—							
Arlaboda and Pittsburgh R'y (under lease)	3,150	1,894	7,317	3,422	4,793	452,318	7,172
Cleveland and Pittsburgh R. R. (under lease)	18,925	11,553	197,133	687,738	47,735	2,165,390	77,874
Lawrence R. R. (under lease)	6,093	1,804	12,005	4,716	5,641	709,066	7,270
Massillon and Cleveland R. R. (under lease)	66	310	220	770	108	27,387	
North Western Ohio R'y (under lease)	4,228	1,980	31,691	8,753	284	217,556	12,503
Pittsburgh, Ft. Wayne and Chicago R'y (under lease)	283,375	243,535	109,622	105,167	129,525	4,241,641	351,583
Pittsburgh, Cincinnati and St. Louis R'y.—Company	19,4219	77,068	386,838	409,459	22,954	3,209,123	137,137
Cincinnati and Muskingum Valley R'y (under lease)	33,397	3,393	30,019	16,094	411	281,051	16,821
Columbus, Chicago and Indiana Central R'y (under lease)	123,278	224,418	38,273	120,905	42,709	2,725,863	235,775
Columbus and Xenia R. R. (under lease)	Included in L. M.						
Little Miami R'y (under lease)	68,738	25,311	176,779	51,460	5,921	836,449	37,591
Rocky River and Lake Erie R. R.—Company	225	3,843	20,438	44,331	44,331	1,295,890	
Rocky River R. R.—Company	(b)						
Scioto Valley R'y.—Company	2,712	3,669	17,562	17,465	2,330	220,582	
Springfield Southern R. R.—Company	None.	168	816	2,430	2,003	91,987	6,569
St. Clairsville and Northern R'y—Trustees							
St. Clairsville R'y.—Company					39	4,574	None.
Toledo, Ann Arbor and Grand Trunk R'y.—Company (from October 15)	176	327	1,913	1,683	1,243	40,568	4,062
Toledo, Canada Southern and Detroit R'y & C. R'y Co. (stock ownership)	72,009	80,904	8,893	239,440	13,634	1,899,567	76,623
Toledo, Delphos and Burlington R. R.—Company	1,409	683	1,068	9,891	7,591	149,353	
Valley Railway—Company		390	38,773	4,365	8,299	186,168	6,179
Wabash, St. Louis and Pacific R'y.—Company	363,372	62,587	124,665	674,422	126,458	4,888,769	
Totals	2,458,105	1,599,894	2,969,109	3,912,758	2,412,091	53,439,387	2,364,819

(a) Not kept.  
 (b) Not reported.  
 (c) Estimated.  
 (d) Includes merchandise.  
 (e) No classification kept.  
 (f) Includes provisions.

TABLE XXII.—EARNINGS.

Name and how operated.	Passenger.	Freight.	Mail.	Express.	Othersources	Total.	Proport'n for Ohio.
Alliance and Lake Erie R. R.—Company.	\$11,024 54	\$23,599 83	\$778 67			\$35,403 09	\$35,403 09
Baltimore and Ohio R. R. Co.—							
Balt. and Ohio R. R. (stock ownership).	336,774 68	1,208,657 82	58,511 07			1,603,943 57	652,881 87
Central Ohio R. R. (under lease).	23,127 43	649,504 40	28,323 08			1,018,444 16	1,018,444 16
Newark, Somerset and Stratford R. R. (under lease).	23,655 57	145,371 06	2,054 72	\$47,309 25		175,291 45	175,291 45
Sandusky, Mansfield and Newark R. R. (under lease).	192,469 29	629,603 51	23,785 12	3,836 03	\$374 07	878,873 42	878,873 42
Belthaire and Southwestern R'y.—Company.	18,227 29	17,829 92	1,835 31	435 86	681 34	39,010 72	39,010 72
Bowling Green R. R. Company.	5,000 00	4,847 50	272 00	240 00		10,359 50	10,359 50
Celina, Van Wert and State Line R'y.—Company (till March 5; sold then to C. V. W. & M. R. R.)	3,080 26	3,349 88				6,430 24	6,430 24
Chagrin Falls and Southern R. R.—Company (from Feb. 1, 1881).	1,082 27	2,925 10	52 50	54 16	7 65	3,721 68	3,721 68
Cincinnati and Eastern R'y.—Lessee.	33,652 48	35,639 63	4,350 91	3,406 28	222 71	76,872 01	76,872 01
Cincinnati, Georgetown and Portsmouth R. R.—Company (from September 13, 1880).	8,771 11	1,775 69	769 72			11,307 52	11,307 52
Cincinnati, Hamilton and Dayton R. R.—Company.	398,137 59	532,336 38	7,945 72	13,620 70	12,255 73	1,004,496 12	1,004,496 12
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership).	115,167 33	280,678 67	6,114 34	6,385 83		437,449 67	86,886 26
Cincinnati, Richmond and Chicago R. R. (lease).	76,779 88	133,997 44	3,818 54	3,898 94		180,637 37	180,637 37
Dayton and Michigan R. R. (lease).	311,565 43	800,720 78	18,700 70	22,502 79	26,244 55	1,179,734 25	1,179,734 25
Cincinnati, Indianapolis, St. Louis and Chicago R'y.—Company.	689,469 14	1,509,441 57	84,350 60	41,706 97	37,049 75	2,366,038 03	100,670 54
Harrison Branch R.R. (under lease).							
Cincinnati Northern R'y.—Company.	1,055 05	228 43		93 79		1,377 27	1,377 27
Cincinnati and Portsmouth R. R.—Receiver (till Sept. 13; sold to C. V. W. & M. R. R. Co.).	2,917 84	271 78	392 11			3,581 73	3,581 73
Cincinnati R. R. Co.—							
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to I. B. & W.).	429,160 38	1,439,641 20	24,843 76	38,501 88	50,340 15	1,982,487 37	5,988 76
Columbus, Springfield and Cincinnati R. R. (till May 1; leased to I. B. & W.).	218,292 94	393,748 06	8,054 83	18,817 67	8,210 32	649,114 02	649,114 02
Cincinnati, Van Wert and Michigan R. R. (by C. V. W. & M. R. R. Co., from March 5; construction contract).	1,047 40	821 59	271 68			2,218 42	2,218 42
Cincinnati and Westwood R. R.—Company.	9,025 61			77 75		9,025 61	9,025 61
Cleveland, Columbus, Cincinnati and Indianapolis R'y.—Company.	867,748 60	3,484,443 83	87,321 11	68,377 26	96,592 86	4,599,483 16	3,605,269 54
Cincinnati and Springfield R'y (under lease).	297,568 21	672,832 42	21,627 58	25,601 22		1,017,629 43	1,017,629 43
Cleveland and Marietta R. R.—Company.	48,039 90	115,498 46	4,870 72	3,834 00		172,243 08	172,243 08
Cleveland, Mt. Vernon and Delaware R. R.—Receiver.	133,563 50	267,768 85	11,679 28	10,658 07	3,422 70	422,092 40	422,092 40
Cleveland, Painesville and Ashtabula R. R.—Company (Not reported).							
Cleveland, Tuscarawas Valley and Wheeling R'y.—Company.	118,633 73	676,773 06	10,347 80	4,749 55	19,872 96	830,377 10	830,377 10
College Hill R. R.—Company (from May 1, 1881).	1,400 40	102 25	150 00			1,652 65	1,652 65
Columbus and Hocking Valley R. R.—Company.	118,557 55	1,041,847 85	4,803 75	6,003 22	15,885 78	1,186,598 11	1,186,598 11
Columbus and Toledo R'y.—Company.	287 27	630 90	639 03	68 92		1,315 18	1,315 18
Columbus and Mansfield R'y.—Company.	162,491 75	563,905 42	8,147 28	9,351 22	29,151 53	773,047 12	773,047 12
Columbus and Washington and Cincinnati R. R.—E. L. Harper, et al.	367 40	4,731 27	1,207 68		970 06	7,276 41	7,276 41
Conotton Valley R'y.—Company.	21,790 87	30,330 31	1,571 93	650 00	4 89	54,710 06	54,710 06
Dayton and Southeastern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.).	37,409 03	139,969 35	4,965 86	1,145 81	867 51	184,357 56	184,357 56
Dayton and Union R. R.—Trustee	60,495 01	71,785 16	2,232 96	2,273 54	3,853 87	140,640 54	140,640 54

	2,964 26	4,518 64	832 00	294 60	8,169 50	8,169 50
Eastern Ohio R. R.—W. H. & C. B. Stevens.....						
Indiana, Bloomington and Western R'y. Co.						
Cin. Sand'y and Cleve'd R. R. } Ohio Division (from May 1).....						
Col. Springfield and Cin. R. R. }						
Iron R. R.—Company.....	46,266 56	92,242 74	2,948 74	4,843 34	18,649 88	153,246 20
Lake Erie and Western R'y.—Company.....	11,538 06	80,818 23			8,122 72	95,479 00
Lake Shore and Michigan Southern R'y.—Company.....	32,171 21	91,039 93	92,710 80	15,767 60	122,865 64	1,411,776 90
Chicago and Canada Southern R'y (by stock ownership and special agreement).....	3,874,632 82	13,663,639 53	656,950 81	279,623 86	153,086 28	18,631,384 20
Mahoning Coal R. R. (under lease). (Included in L. S. & M. S.)						
Marietta and Cincinnati R. R.—Receiver						
Baltimore Short Line R'y (special agreement). (Included in M. and C.).....	14,777 36	35,248 96	8,786 96	682 50	54,495 73	3,602 18
Cincinnati and Baltimore R'y (special agreement). (Included in M. and C.).....	436,721 93	1,308,949 28	62,391 82	76,238 28	13,047 68	2,120,404 24
New York, Pennsylvania and Ohio R. R.—Company.....	1,161,266 28	4,221,174 25	46,435 46	64,333 71	107,770 23	5,604,469 94
Cleveland and Mahoning Valley R'y (under lease). (Included in N. Y. P. and O.).....						
Ohio Central R. R.—Company.....	35,536 33	272,430 47	4,887 76	1,102 22	22,115 83	336,142 61
Ohio and Mississippi R'y.—Receiver.....	1,943,336 48	2,946,319 53	86,575 13	155,453 41	4,435,714 55	140,514 52
Ohio and West Virginia R'y.—Company.....	42,603 26	55,488 80	2,815 83	1,317 30	6,661 96	108,980 65
Painesville, Canton and Bridgeport N. G. R. R.—Company and Receiver (all February 1; sold to C. F. and S.) (None reported).....						
Palmer and Youngstown R'y.—Company.....						
Paulding and Cecil R'y.—Company (none reported).....	17,530 14	54,011 54	2,595 14	1,023 18	1,782 02	76,942 02
Pennsylvania Company.....						
Ashland and Pittsburgh R'y (under lease).....	29,637 85	965,876 65	2,754 76	1,711 12	3,485 40	393,444 68
Cleveland and Pittsburgh R. R. (under lease).....	475,880 65	2,543,542 03	27,675 11	39,999 96	3,134,466 90	2,614,092 80
Lawrence R. R. (under lease).....	72,782 18	167,995 10	901 35	8,130 00	185,285 81	106,568 78
Massillon and Cleveland R. R. (under lease).....	1,418 62	8,250 37	458 72		10,197 71	10,197 71
North Western Ohio R'y (under lease).....	61,018 31	175,793 45	5,416 02	9,330 00	33,023 34	287,631 02
Pittsburgh, Ft. Wayne and Chicago R'y (under lease).....	2,321,560 54	7,934,204 88	154,945 73	141,891 00	10,719,661 57	5,764,613 63
Pittsburgh, Cincinnati and St. Louis R'y.—Company.....	864,681 49	3,196,588 81	162,786 01	76,210 26	4,337,850 16	4,337,850 16
Cincinnati and Muskingum Valley R'y (under lease).....	118,405 43	929,671 25	10,555 35	8,492 55	6,643 63	384,284 61
Columbus, Chillicothe and Indiana Central R'y (under lease).....	1,006,719 64	3,747,372 97	185,821 43	69,204 21	5,676 73	5,676,772 83
Columbus and Xenia R. R. (under lease). (Included in L. M.)						
Little Miami R'y (under lease).....	800,646 15	756,375 93	52,728 69	44,015 14	186,702 03	1,580,697 94
Dayton and Western R. R. (included in L. M.).....						
Pittsburgh and Lake Erie R. R.—Company.....	163,576 81	767,130 67	7,216 88	7,725 00	686 38	948,064 74
Rocky River R. R.—Company.....	11,292 00	11,292 00				11,292 00
Scioto Valley R'y.—Company.....	133,823 05	187,780 90	8,068 89	3,701 60	13,986 93	348,021 86
Springfield Southern R. R.—Company.....	32,640 87	137,394 40	5,246 70	952 41	9,401 88	181,621 76
St. Charlesville and Northern R'y.—Company.....	None.					
St. Clairsville R'y.—Company.....	3,591 95	2,106 15	387 64			6,085 74
Toledo, Ann Arbor and Grand Trunk R'y.—Company (from Oct. 15)	22,308 82	89,529 36	1,259 74	1,649 68	31,319 86	96,822 46
Toledo, Can. S'm and Detroit R'y (by C. S. R'y Co.; stock ownership)	162,130 50	225,247 44	10,187 40	5,349 62	602,914 96	77,413 07
Toledo, Delphos and Burlington R. R.—Company.....	67,452 09	130,015 41			197,467 40	197,467 40
Valley Railway—Company.....	88,347 02	124,508 02	3,170 66	3,050 83	6,161 89	224,247 42
Wabash, St. Louis and Pacific R'y.—Company.....	2,606,077 71	10,184,576 90	254,306 95	341,908 67	144,234 46	13,441,104 78
Totals.....	820,801,079 13	3,675,607,360 91	\$1,735,405 58	\$1,897,800 46	\$96,218,801 41	\$45,822,084 64

TABLE XXIII.—OPERATING EXPENSES.

Name and how operated.	Maintenance of way.	Maintenance of cars.	Motive power.	Conducting transportation.	General.	Total.	Per cent. of earnings.	Proportion for Ohio.
Alliance and Lake Erie R. R.—Company.....	\$9,689 15	\$932 77	\$5,193 89	\$6,208 94	\$6,014 02	\$25,038 77	70.72	\$25,038 77
Baltimore and Ohio R. R.—Co.....	316,587 44	138,607 21	151,744 19	459,422 10	109,573 93	1,173,934 87	82.33	477,848 58
Balt. and Ohio and Chicago R. R. (stock ownership)	267,619 14	71,297 73	146,266 06	361,224 85	45,736 89	792,151 67	77.78	792,151 67
Central Ohio R. R. (under lease).....	43,471 51	14,095 61	27,084 17	45,125 76	7,797 81	137,574 92	78.18	137,574 92
New, Seneca and Straitsville R. R. (under lease)	246,695 42	63,579 48	144,832 35	231,007 18	49,858 71	733,973 17	83.71	733,973 17
Sand., Mansfield and Newark R. R. (under lease).....	14,024 69	1,824 09	6,012 58	4,183 42	6,438 19	32,790 88	84.06	32,790 88
Bel Aire and Southwestern R. R.—Company.....	600 00	50 00	100 00	550 00	2,353 09	3,553 09	30.00	3,553 09
Bowling Green R. R.—Lessee.....	(a)	(a)	(a)	(a)	216 00	5,979 71	92.99	5,979 71
Celina, Van Wert and State Line R. R.—Company (till March 5; sold then to C., V. W. & M. R. R. Co.).....	(a)	(a)	(a)	(a)	2,479 13	2,479 13	66.62	2,479 13
Chagrin Falls and Southern R. R.—Company (from Feb. 1, 1881).....	15,559 74	1,985 74	19,569 81	13,727 71	10,653 41	61,394 51	79.00	61,394 51
Cincinnati and Eastern R. R.—Company.....	3,610 32	343 18	813 54	4,705 89	1,513 87	11,025 89	97.50	11,025 89
Cincinnati, Georgetown and Portsmouth R. R.—Company (from Sept. 13, 1880).....	119,288 56	86,213 89	143,748 72	267,345 23	73,736 07	619,291 47	56.39	619,291 47
Cincinnati, Hamilton and Dayton R. R.—Company.....	113,691 92	48,737 01	46,038 55	57,011 13	31,776 31	216,211 10	79.36	68,817 87
Cin'ti, Ham. and Indiana R. R. (stock ownership)	33,663 74	41,106 78	37,521 31	98,190 29	11,289 37	171,765 62	75.82	137,219 41
Cin'ti, Richmond and Chicago R. R. (lease).....	276,908 10	102,332 82	200,306 06	153,457 37	91,400 21	821,463 16	69.86	821,463 16
Dayton and Michigan R. R. (lease).....	345,559 40	130,990 67	291,873 39	512,273 56	97,871 69	1,457,668 71	59.35	113,153 45
Cin'ti, Ind., St. Louis and Chicago R. R.—Company.....	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Harrison Branch R. R. (under lease). (Included in C., I., St. L. & C.).....	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Cincinnati Northern R. R.—Company.....	1,022 86	75,777 89	318,480 97	1,479 78	455 21	2,957 88	72.50	2,957 88
Cincinnati and Portsmouth R. R.—Receiver (till Sept. 13; sold to C., G. & P. R. R. Co.).....	443 38	75,777 89	318,480 97	345,701 00	112,600 52	863,006 56	43.00	2,756 97
Cincinnati R. R. Co.....	112,620 50	33,207 65	130,318 11	44,157 52	150,252 22	470,586 00	72.49	470,586 00
Cin'ti, Sandusky and Cleveland R. R.—Company (till May 1; leased to J., B. & W.).....	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Cin'ti, Columbus, Springfield and Cin'ti R. R. (till May 1; leased to J., B. & W.).....	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Cin'ti, Van Wert and Michigan R. R. (by C., V. W. & M. R. R. Co., from March 5; construction contract).....	220 53	79 55	408 78	210 25	59 09	1,109 11	50.00	1,109 11
Cin'ti, Van Wert and Westwood R. R.—Company.....	1,264 23	2,288 22	2,288 22	9,315 91	5,003 46	9,315 91	103.21	9,315 91
Gleve, Col. and Indiana R. R.—Company.....	550,900 36	300,615 80	291,306 07	1,755,439 36	225,660 57	3,013,658 16	66.16	2,288,262 15
Cin'ti and Springfield R. R. (under lease).....	127,702 94	29,008 97	39,005 10	38,1133 31	8,720 70	662,901 02	65.14	662,901 02
Cleveland and Marietta R. R.—Company.....	62,559 34	72,014 81	13,227 63	44,757 29	1,889 30	118,299 17	86.13	148,399 17
Cleveland, M. Vernon and Delaware R. R.—Receiver (Not reported).....	142,730 83	26,013 93	88,614 93	72,309 78	29,277 45	336,006 92	84.31	336,006 92
Cleveland, Tuscarora and Ashland R. R.—Company.....	156,901 26	40,992 60	52,298 39	207,528 11	48,851 65	503,431 01	60.63	503,431 01
College Hill R. R.—Company (till May 1, 1881).....	303 88	41 84	700 96	330 03	1,049 68	1,059 68	65.39	1,059 68
Columbus and Hocking Valley R. R.—Company.....	131,626 81	161,253 81	201,332 93	161,498 11	66,230 30	725,072 34	61.32	725,072 34
Columbus and Maysville R. R.—Company.....	211 75	99 82	168 03	64 70	1,878 07	1,878 07	439.61	1,878 07
Columbus and Toledo R. R.—Company.....	127,732 72	21,977 50	114,345 36	115,639 10	69,401 92	410,065 60	67.05	440,065 60

[illegible]

TABLE XXIII.—OPERATING EXPENSES—Continued.

Name and how operated.	Maintenance of way.	Maintenance of cars.	Motive power.	Conducting transportation.	General.	Total.	Per cent. of earnings.	Proportion for Ohio.
Toledo, Canada Southern and Detroit R'y (by C. S. R'y Co.; stock ownership).....	\$60,377 89	\$79,181 71	.....	\$235,880 20	\$59,207 82	\$434,417 62	86.39	\$75,376 25
Toledo, Delphos and Burlington Railroad—Company (Not reported).....	21,729 83	5,371 72	\$4,435 47	60,421 86	18,403 87	113,362 75	50.50	113,362 75
Valley Railway—Company.....	1,533,630 54	987,061 37	3,411,226 60	2,084,920 11	496,331 58	9,113,190 20	67.80	297,104 27
Wabash, St. Louis and Pacific R'y—Company.....								
Totals .....	\$14,059,005 10	\$6,055,610 58	\$12,574,893 21	(g) \$23,768,604 45	\$4,849,156 62	(f) \$61,313,043 71	63.72	\$29,301,700 05

(a) These are all massed together into a total of \$5,763.75.

(b) Operated by the construction company building it, and not given in the report.

(c) None reported.

(d) Included in N. Y., P. &amp; O.

(e) Accounts not kept so these can be reported.

(f) This total is greater than the sum of the other columns, owing to a few companies reporting only totals.

(g) Includes \$37,202.07 for telegraphing reported by M. &amp; C. Railroad.



TABLE XXIV.—RESULTS OF OPERATING, AND TAXES PAID IN OHIO.

Name, and how operated.	Miles operated.		Net earnings.	Deficits.	Rentals of road, track, depots, etc.	Net income over operating expenses and rentals.	Loss in operating line.	Taxes paid in Ohio.
	Entire line.	In Ohio.						
Alliance and Lake Erie Railroad—Company.	25.00	25.00	\$10,364 32			\$10,364 32		\$713 75
Baltimore and Ohio Railroad—Company.								
Baltimore and Ohio and Chicago Railroad (stock ownership).	271.00	110.31	430,008 70			430,008 70		20,243 17
Central Ohio Railroad (under lease).	137.00	137.00	226,289 49		\$356,455 46		\$130,165 97	26,692 56
Newark, Somerset and Straitsville Railroad (under lease).	44.00	44.00	37,716 53		32,357 44		14,870 91	5,881 55
Sandusky, Mansfield and Newark Railroad (under lease).	116.25	116.25	142,290 25		194,356 00		51,449 75	21,108 20
Bellaire and Southwestern Railway—Company.	42.00	42.00	6,219 84			6,219 84		937 90
Bowling Green Railroad—Company.	5.50	5.50	6,806 50		980 00	5,826 50		273 00
Celina, Van Wert and State Line R'y—Company (till March 5; sold then to C., V. W. & M. Railroad Company).	(g) 10.50	(g) 10.50	450 50			450 50		216 00
Chagrin Falls and Southern Railroad—Company (from February 1, 1881).	5.00	5.00	1,242 55			1,242 55		(a)
Cincinnati and Eastern Railway—Company.	87.00	87.00	15,477 50			15,477 50		1,969 10
Cincinnati, Georgetown and Portsmouth Railroad—Company (from September 13, 1880).	20.40	20.40	281 72			281 72		1,513 87
Cincinnati, Hamilton and Dayton Railroad—Company.	60.00	60.00	475,101 65			475,101 65		26,601 37
Cincinnati, Hamilton and Indianapolis Railroad (stock ownership).	98.20	19.50	90,738 57		6,000 00	84,738 57		1,243 86
Cincinnati, Richmond and Chicago Railroad (lease).	44.50	35.55	54,348 60		18,000 00	36,348 60		2,291 00
Dayton and Michigan Railroad (lease).	142.80	142.00	355,129 09		12,900 00	342,229 09		39,243 07
Cincinnati, Indianapolis, St. Louis and Chicago Railway—Company.	273.63	22.06	961,489 32		6,894 88	954,594 44		10,514 12
Harrison Branch Railroad (under lease).	Included in C., I. & C.	(b) 1,377 27				1,377 27		(b)
Cincinnati Northern Railway—Company.	24.20	24.20	623 85			623 85		455 24
Cincinnati and Portsmouth Railroad—Receiver (till Sept. 13; sold to C., G. & P. Railroad Company).	(g) 20.40	(g) 20.40	1,129,421 01		1,034,412 25	95,008 76		75 52
Cincinnati, G. & P. Railroad Company.	336.00	1,015						
Cincinnati Railroad Company.								
Cincinnati Southern Railway (under license).								
Cincinnati, Sandusky and Cleveland Railroad—Company (till May 1; leased to L., B. and W.).	190.03	190.03	178,528 02					31,174 73
Columbus, Springfield and Cincinnati Railroad (till May 1; leased to L., B. & W.).	Included in C., S. & C.							
Cincinnati, Van Wert and Michigan Railroad (by C., V. W. & M. C. Co., from March 5; construction contract).	13.10	13.10	1,109 31			1,109 31		210 25
Cincinnati and Westwood Railroad—Company.	5.63	5.63		\$290 30	2,231 73		2,522 03	854 07
Cleveland, Columbus, Cincinnati and Indianapolis Railway—Company.	391.15	306.60	1,556,445 00			1,556,445 00		105,567 36
Cincinnati and Springfield Railway (under lease).	80.20		854,728 41		176,772 95	1,779,554 46		17,262 92

TABLE XXIV.—RESULTS OF OPERATING, AND TAXES PAID IN OHIO—Continued.

Name; and how operated.	Miles operated.		Net earnings.	Deficits.	Rentals of road, track, depots, etc.	Net income over operating expenses and rentals.	Loss in operating line.	Taxes paid in Ohio.
	Entire line.	In Ohio.						
Cleveland and Marietta Railroad—Company	98.19	98.19	28,843 61		\$2,904 38	\$20,939 23		\$2,012 35
Cleveland, Mt. Vernon and Delaware Railroad—Receiver	145.00	145.00	66,085 48		8,797 10	57,288 38		10,675 33
Cleveland, Painesville and Ashabula Railroad—Company	Not reported.							
Cleveland, Tuscarawas Valley and Wheeling Railroad—Company	158.50	158.50	325,946 06		2,977 06	323,969 00		12,717 37
College Hill Railroad—Company (from May 1, 1881)	6.00	6.00	502 97			502 97		(a)
Columbus and Hickering Valley Railroad—Company	112.00	112.00	461,525 77		2,628 80	458,896 97		23,968 17
Columbus and Maxville Railroad—Company	18.70	18.70		\$332 89			\$332 89	104 97
Columbus and Toledo Railroad—Company	124.00	124.00	332,980 52		12,611 40	320,369 12		23,504 90
Columbus, Washington and Cincinnati Railroad—Receiver (till May 21)	20.18	20.18		1,492 10			1,492 10	241 12
Commonwealth Valley Railroad—Company	60.20	60.20	17,768 25			17,768 25		(a)
Dayton and Southeastern Railroad—Receiver (till May 21, then consolidated with T. D. & E. Railroad)	(g) 115.00	(g) 115.00	50,855 26		6,001 85	44,853 51		5,364 56
Dayton and Union Railroad—Franchise	46.74	46.74	61,378 78		13,000 00	47,378 78		3,954 91
Eastern Ohio Railroad—Lessee	7.75		6,236 25			6,236 25		130 00
Indiana, Bloomington and Western Railroad Company	(g) 190.03	(g) 190.03	77,572 05		50,000 00	27,572 05		(a)
Cincinnati, Sandusky and Cleveland R. R. (Ohio Division)								
Columbus, Springfield and Cincinnati R. R. (from May 1, 1881)	18.00	18.00	33,542 06			33,542 06		2,921 47
Iron Railroad—Company	586.43	586.43	329,155 10		11,580 90	317,574 20		(a)
Lake Erie and Western Railroad—Company	1,177.67	420.81	8,686,988 97		1,213,366 43	7,473,572 54		237,156 69
Lake Shore and Michigan Southern Railroad (by stock ownership and special agreement)	70.48	4.66	805 28			805 28		1,677 37
Mahoning Coal Railroad (under lease)	Included in L. S. & M. S.							
Marietta and Cincinnati Railroad—Receiver	280.80	280.80	292,470 87		291,219 91		88,749 04	58,711 25
Baltimore Short Line Railroad (special agreement)	Included in M. & C.							
Cincinnati and Baltimore Railroad (special agreement)	Included in M. & C.							
New York, Pennsylvania and Ohio Railroad—Company	567.42	373.34	1,656,163 52		684,846 88	971,316 64		73,037 37
Cleveland and Mahoning Valley Railroad (under lease)	Included in N. Y. P. & O.							177 52
Ohio Central Railroad—Company	213.30	213.30	126,399 08		9,263 45	117,135 63		2,170 96
Ohio and Mississippi Railroad—Receiver	616.20	19.52	1,118,656 63			1,118,656 63		4,823 09
Ohio and West Virginia Railroad—Company	84.00	84.00	42,635 37			42,635 37		17,411 80
Painesville, Canton and Bridgeport N. G. Railroad—Company and Receiver (till Feb'y 1, sold to C. P. & S.)	(d)							
Painesville and Youngstown Railroad—Company	61.80	61.80		19,423 29			19,423 29	2,422 65
Pandling and Cecil Railroad—Company	(a)							
Pennsylvania Company								
Ashabula and Pitsburgh Railway (under lease)	62.60	62.60	113,636 78		8,431 70	105,205 08		8,155 92

Cleveland and Pittsburgh Railroad (under lease)	223.30	182.73	1,705,455 44	.....	1,325,898 98	370,556 46	.....	65,351 43
Lawrence Railroad (under lease)	22.04	12.68	81,481 74	.....	71,114 71	7,367 03	.....	1,265 71
Massillon and Cleveland Railroad (under lease)	12.23	12.23	.....	590 27	24,000 00	.....	20,500 27	791 41
North Western Ohio Railroad (under lease)	79.98	79.98	66,384 10	.....	50,073 61	16,310 49	.....	9,679 94
Pittsburgh, Ft. Wayne and Chicago Railway (under lease)	467.97	251.66	4,964,539 84	.....	3,314,082 50	1,650,476 84	.....	131,793 44
Pittsburgh, Cincinnati and St. Louis Railway—(Company)	290.84	158.66	1,786,289 53	.....	37,500 00	1,718,789 53	.....	32,871 99
Cincinnati and Muskingum Valley Railway (under lease)	148.45	148.45	25,914 91	.....	105,000 00	.....	79,085 09	15,916 75
Columbus, Chicago and Indiana Central Railway (under lease)	580.50	135.90	651,874 97	.....	651,874 97	.....	.....	30,587 07
Little Miami Railroad (under lease)	196.14	191.95	502,240 02	.....	702,680 54	.....	200,440 52	51,128 23
Pittsburgh and Lake Erie Railroad—Company	70.35	9.20	503,904 95	.....	11,851 09	492,053 86	.....	1,636 26
Rocky River Railroad—Company	5.53	5.53	1,812 46	.....	.....	1,842 40	.....	291 92
Scioto Valley Railway—Company	102.11	102.11	128,349 31	.....	9,333 50	118,415 81	.....	11,304 33
Springfield Southern Railroad—Company	113.42	113.42	4,665 17	.....	.....	4,665 17	.....	2,678 34
St. Clairsville Northern Railway—Company	(a)	.....	.....	.....	.....	.....	.....	.....
St. Clairsville Railway—Company	6.65	6.65	1,814 87	.....	.....	1,814 87	.....	121 98
Toledo, Ann Arbor and Grand Trunk Railway—Company (from October 15)	46.00	5.00	29,431 64	.....	23,276 20	6,205 44	.....	(a)
Toledo, Canada Southern and Detroit Railway (by C. S. Railway Company; stock ownership)	55.87	8.60	68,467 34	.....	55,235 17	13,232 17	.....	1,833 77
Toledo, Delphos and Burlington Railroad—Company	385.40	314.40	.....	.....	.....	.....	.....	.....
Valley Railway—Company	58.70	58.70	110,884 67	.....	.....	110,884 67	.....	2,467 80
Wabash, St. Louis and Pacific Railway—Company	2,558.88	75.00	4,327,914 68	.....	750,540 30	3,577,374 38	.....	29,721 51
<b>Totals</b>	12,092.11	5,846.98	\$345,7568 21	\$22,328 85	\$11,311,846 14	\$23,831,120 69	\$609,321 86	\$1,293,334 28

(a) Not given. (b) No operating expenses given—operated by a construction company. No taxes reported.

(d) No mileage or earnings reported.

(g) Not included in the total, because counted in other places.

TABLE XXV.—EARNINGS AND EXPENSES PER MILE, ETC.

Name, and how operated.	Amount per mile of—				Proportion for Ohio of—			
	Gross earnings.	Operating expenses.	Net earnings.	Loss.	Earnings.	Operating expenses.	Net earnings.	Loss.
Alliance & Lake Erie R. R.—Company.	\$ 1,416 12	\$1,001 57	\$414 57	.....	\$35,403 09	\$25,038 77	\$10,364 32	.....
Baltimore & Ohio R. R. Co.—	.....	.....	.....	.....	.....	.....	.....	.....
Baltimore & Ohio R. R. (stock ownership).....	5,918 61	4,331 87	1,586 74	.....	652,881 87	477,848 58	175,033 29	.....
Central Ohio R. R. (under lease).....	7,433 90	5,782 15	1,651 75	.....	1,018,444 16	792,154 67	226,289 49	.....
Newark, Somerset & Straitsville R. R. (under lease).....	3,983 80	3,126 70	857 10	.....	175,291 45	137,574 92	37,716 53	.....
Sandusky, Man-field & Newark R. R. (under lease).....	7,500 20	6,230 95	1,269 25	.....	878,873 42	738,973 17	142,900 25	.....
Bellevue & Southwestern R'y.—Company.....	928 82	780 73	148 09	.....	39,010 72	32,790 88	6,219 84	.....
Bowling Green R. R.—Company.....	1,883 54	824 18	1,059 36	.....	10,359 50	3,553 00	6,806 50	.....
Celina, Van Wert & State Line R'y.—Company (till March 5; sold then to C. V. W. & M. R. R. Co.).....	612 40	569 50	42 90	.....	6,430 24	5,979 74	450 50	.....
Chagrin Falls & South R. R.—Co. (from Feb. 1, 1881).....	744 34	495 83	248 51	.....	2,721 68	2,179 13	1,242 55	.....
Cincinnati & Eastern R'y.—Company.....	883 58	705 67	177 90	.....	76,872 01	61,394 51	15,477 50	.....
Cincinnati, Georgetown & Portsmouth R. R.—Co. (from Sept. 12, 1880).....	585 27	551 29	14 08	.....	11,207 52	11,025 80	281 72	.....
Cincinnati, Hamilton & Dayton R. R.—Company.....	18,241 60	10,323 24	7,918 36	.....	1,094,496 12	619,394 47	475,101 65	.....
Chn., Ham. & Ind. R. R. (stock ownership).....	4,454 08	3,580 06	864 02	.....	86,846 26	68,847 87	18,018 39	.....
Chn., Richmond & Chicago R. R. (lease).....	3,081 22	3,859 90	1,224 32	.....	180,637 37	137,249 44	43,387 93	.....
Dayton & Michigan R. R. (lease).....	8,367 98	5,807 08	2,560 90	.....	1,179,734 25	823,605 16	355,129 09	.....
Chn., Ind., St. Louis & Chicago R'y.—Company.....	8,643 27	5,129 44	3,513 83	.....	190,670 54	113,155 45	77,515 09	.....
Harrison Branch R. R. (under lease).....	Included in C., I. St. L. & C.	.....	.....	.....	.....	.....	.....	.....
Cincinnati Northern R'y.—Company.....	56 91	.....	56 91	.....	1,377 27	.....	1,377 27	.....
Cincinnati & Portsmouth R. R.—Receiver (till Sept. 15; sold to C. V. W. & P. R. Co.).....	175 57	144 99	30 58	.....	3,581 73	2,957 88	623 85	.....
Cincinnati R. R. Co. ....	5,900 26	2,538 89	3,361 37	.....	5,988 76	2,576 97	3,411 79	.....
Cincinnati R. R. (under license).....	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati, Sandusky & Cleveland R. R.—Co. (till May 1; leased to I. B. & W.).....	3,416 40	2,476 37	940 53	.....	619,114 02	470,586 00	178,528 02	.....
Columbus, Springfield & Cincinnati R. R. (till May 1; leased to I. B. & W.).....	Included in C., S. & C.	.....	.....	.....	.....	.....	.....	.....
Cincinnati, Van Wert & Michigan R. R. (by C. V. W. & M. C. Co. from March 5; construction contract).....	169 34	84 66	84 68	.....	2,218 42	1,109 11	1,109 31	.....
Cincinnati & Westwood R. R.—Company.....	1,603 11	1,654 67	.....	.....	9,025 61	9,315 91	.....	.....
Cleveland, Col. Chn. & Indianapolis R'y.—Company.....	11,758 87	7,779 72	3,979 15	\$51 56	3,605,369 54	2,385,262 15	1,220,007 39	\$290 30
Chn. & Springfield R'y. (under lease).....	12,688 65	8,955 60	4,423 05	.....	1,017,620 43	662,901 02	354,728 41	.....
Cleveland & Marietta R. R.—Company.....	172 24	148 40	23 84	.....	172,243 08	148,390 47	23,843 61	.....
Cleveland, Mt. Vernon & Delaware R. R.—Receiver.....	292 31	246 51	45 77	.....	422,092 40	356,006 92	66,085 48	.....
Cleveland, Painesville & Ashland R. R.—Company.....	Not reported	.....	.....	.....	.....	.....	.....	.....
Cleveland, Tuscarawas Valley & Wheeling R'y.—Co. ....	5,238 97	3,176 22	2,062 75	.....	830,377 10	503,431 04	326,946 06	.....

College Hill R. R.—Company (from May 1, 1881).....	275 61	176 61	99 00	1,652 65	1,059 68	592 97
Columbus & Hocking Valley R. R.—Company.....	10,594 62	4,732 87	4,120 75	1,186,698 11	725,072 84	461,525 77
Columbus & Maysville R'y—Company.....	71 93	100 43	28 50	1,345 18	1,878 07	583 89
Columbus & Toledo R. R.—Company.....	6,234 95	3,650 63	2,583 62	773,047 12	440,066 60	332,980 52
Columbus, Washington & Cincinnati R. R.—Receiver (till May 21).....	360 57	434 51	73 94	7,276 41	8,768 51	1,492 10
Compton Valley R'y—Company.....	908 80	613 64	295 16	54,710 06	36,941 81	17,768 25
Dayton & Southeastern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.).....	1,603 11	1,160 89	412 22	184,257 56	133,502 20	50,855 36
Dayton and Union R. R.—Trustee.....	3,008 99	1,695 80	1,913 19	140,640 54	79,261 76	61,878 78
Eastern Ohio R. R.—Lease.....	1,054 13	260 75	803 38	8,169 50	1,943 25	4,226 23
Indiana, Bloomington & Western R'y Co.....	846 43	398 22	408 21	153,240 26	75,674 21	77,572 05
Chn., Sandusky & Cleveland R'y Co. } Ohio Div. (from May 1)						
Coln., Springfield & Ctn. R. R. }						
Iron R. R.—Company.....	5,304 38	3,440 93	1,663 45	95,479 00	61,986 94	33,542 06
Lake Erie & Western R'y—Company.....	3,653 38	2,801 00	811 78	582,297 47	408,193 12	121,104 35
Lake Shore & Mich. Southern R'y—Company.....	15,820 55	8,444 18	7,376 37	6,657,266 40	3,653,277 28	3,103,989 12
Chicago & Canada Southern R'y (by stock ownership) and special agreement).....	773 00	761 00	12 00	3,602 18	3,546 26	55 92
Maioning Coal R. R. (under lease).....	Included in L. S. & M. S.					
Marietta & Cincinnati R. R.—Receiver.....	7,351 29	6,830 24	721 05	2,120,404 24	1,917,383 37	202,470 87
Baltimore Short Line R'y (special agreement).....	Included in M. & C.					
Cincinnati & Balt. R'y (special agreement).....	Included in M. & C.					
New York, Pennsylvania & Ohio R. R.—Company.....	9,877 11	6,958 34	2,918 77	3,687,470 85	2,697,791 86	1,089,679 00
Cleveland & Mahoning Valley R'y (under lease).....	Included in N. Y., P. & O.				8,624 48	
Ohio Central R. R.—Company.....	1,575 00	983 00	592 00	336,142 61	209,743 53	126,399 08
Ohio & Mississippi R'y—Receiver.....	7,198 49	5,383 08	1,815 41	140,514 52	105,077 72	38,436 80
Ohio & West Virginia R'y—Company.....	1,297 39	789 78	507 61	106,980 65	66,345 28	42,635 37
Painesville, Canton & Bridgeport N. G. R. R.—Company and Receiver (till Feb. 1; sold to C. F. & S.).....	<sup>b</sup>					
Painesville & Youngstown R'y—Company.....	1,245 02	1,559 31	314 29	76,942 02	96,365 31	19,423 29
Paulding & Cecil R'y—Company.....	<sup>b</sup>					
Pennsylvania Company—						
Ashtabula & Pittsburgh R'y (under lease).....	4,847 04	3,031 88	1,815 16	393,444 58	189,807 90	113,636 78
Cleveland & Pittsburgh R. R. (under lease).....	14,305 71	6,688 21	7,637 50	2,614,082 39	1,218,482 01	1,395,600 38
Lawrence R. R. (under lease).....	8,406 84	4,769 84	3,697 00	106,598 73	59,720 77	46,877 96
Massillon & Cleveland R. R. (under lease).....	828 10	876 37	48 27	10,127 71	10,717 68	590 27
North Western Ohio R'y (under lease).....	3,506 27	2,766 30	829 97	287,641 02	221,256 92	66,384 10
Pittsburgh, Ft. Wayne & Chi. R'y (under lease).....	22,906 72	12,208 01	10,608 71	5,704,013 53	3,094,868 00	2,660,745 53
Pittsburgh, Cincinnati & St. Louis R'y—Company.....	21,598 54	12,704 44	8,894 10	3,426,824 36	2,015,086 45	1,411,137 91
Chi. & Muskingum Valley R'y (under lease).....	2,588 64	2,414 07	1,174 57	384,284 31	389,369 70	25,914 97
C. & Chi. & Indiana Central R'y (under lease).....	6,657 03	7,514 07	1,122 96	1,173,772 38	1,021,162 11	152,610 27
Columbus & Xenia R. R. (under lease).....	Included in L. M.					
Dayton & Western R'y.....	Included in L. M.					
Little Miami R'y (under lease).....	8,049 03	5,498 41	2,560 62	1,546,930 81	1,055,419 80	491,511 01
Pittsburgh and Lake Erie R. R.—Company.....	13,175 97	6,313 14	7,162 83	58,080 89	58,080 89	65,837 03
Rocky River R. R.—Company.....	2,041 95	1,708 77	333 18	11,292 00	9,449 60	1,842 40
Scioto Valley R'y—Company.....	3,408 29	2,451 32	1,256 97	348,021 36	210,672 05	128,349 31
Springfield Southern R. R.—Company.....	1,601 32	1,660 19	41 13	181,631 76	176,956 59	4,665 17
St. Clairsville & Northern R'y—Company.....	<sup>b</sup>					
St. Clairsville R'y—Company.....	925 25	656 05	279 20	6,085 74	4,270 87	1,814 87
St. Clairsville R'y—Company.....	2,104 40	1,463 91	640 49	10,522 00	7,319 55	3,202 45
Toledo, Ann Arbor & Grand Trunk R'y—Co. (from Oct. 15).....						

TABLE XXV.—EARNINGS AND EXPENSES PER MILE, ETC.—Continued.

Name, and how operated.	Amount per mile of —				Proportion for Ohio of —			
	Gross earnings.	Operating expenses.	Net earnings.	Loss.	Earnings.	Operating expenses.	Net earnings.	Loss.
Toledo, Canada Southern & Detroit R'y (by C. S. R'y Co., stock ownership) .....	\$9,001.52	\$8,764.68	\$236.84	.....	\$75,413.07	\$75,376.25	\$2,036.82	.....
Toledo, Delphos & Burlington R. R.—Company .....	<i>b</i>	<i>b</i>	<i>b</i>	.....	107,467.50	.....	<i>b</i>	.....
Valley Railway—Company .....	3,820.22	1,491.22	1,889.00	.....	234,247.42	113,382.75	110,864.67	.....
Wabash, St. Louis & Pacific R'y—Company .....	5,552.73	3,561.39	1,691.34	.....	336,364.75	267,164.25	126,850.36	.....
Totals .....	.....	.....	.....	.....	\$45,822,984.61	\$29,301,769.65	<i>c</i> \$16,332,441.57	22,228.85

(a) No operating expenses reported.

(b) Nothing reported.

(c) This total is not the difference between the two preceding columns, because of the U. &amp; M. V. having no earnings, and the T., D. &amp; B. reporting no operating expenses.



TABLE XXVI.—INTEREST AND DIVIDENDS.

Name, and how operated.	Interest—		Dividends on stock.				Applied to—	
	On bonds.	On floating debt.	General.	Per cent.	Preferred.	Per cent.	Cancelling bonds or to sinking fund.	Liquidation of floating debt.
Alliance and Lake Erie R. R.—Company .....	a	a	a	a	a	a	a	a
Baltimore and Ohio R. R.—	a	a	a	a	a	a	a	a
Baltimore and Ohio R. R. (stock ownership).....	a	a	a	a	a	a	a	a
Central Ohio R. R. (under lease).....	\$150,000 00	a	\$150,074 50	6 50	\$24,693 00	6 00	a	a
Newark Somerset and Stratfield R. R. (under lease).....	a	a	a	a	a	a	a	a
Sandusky, Mansfield and Newark R. R. (under lease).....	177,675 00	a	22,553 00	a	a	a	a	a
Bellair and Southwestern R'y—Company .....	a	a	a	a	a	a	a	a
Bowling Green R. R.—Company .....	a	a	a	a	a	a	a	a
Celina, Van Wert and State Line R'y—Company (till March 5; sold then to C. V. W. & M. R. R. Co.) .....	a	a	a	a	a	a	a	a
Chagrin Falls and Southern R. R.—Company (from Feb. 1, 1881).....	a	a	a	a	a	a	a	a
Cincinnati and Eastern R'y—Company .....	37,197 50	a	a	a	a	a	\$187,639 72	a
Cincinnati, Georgetown and Portsmouth R. R.—Company from September 13, 1889).....	a	a	a	a	a	a	a	a
Cincinnati, Hamilton and Dayton R. R.—Company .....	182,604 69	\$1,410 88	70,000 60	2 00	a	a	24,000 00	a
Cincinnati, Hamilton and Indianapolis R. R. (stock ownership).....	126,000 00	a	a	a	a	a	a	a
Cincinnati, Richmond and Chicago R. R. (lease) .....	43,120 00	a	a	a	a	a	a	a
Dayton and Michigan R. R. (lease) .....	190,086 03	a	36,002 74	3 50	96,900 00	8 00	a	a
Cincinnati and Indianapolis, St. Louis and Chicago R'y—Company .....	556,449 05	a	180,000 00	6 00	a	a	100 00	a
Harrison Branch R. R. (under lease) .....	a	a	a	a	a	a	a	a
Cincinnati Northern R'y—Company .....	a	a	a	a	a	a	a	a
Cincinnati and Portsmouth R. R.—Receiver (till Sept. 13; sold to C. V. W. & P. R. R. Co.).....	a	a	a	a	a	a	a	a
Cincinnati R. R. Co. ....	a	a	a	a	a	a	a	a
Cincinnati Southern R'y (under license).....	a	a	a	a	a	a	a	a
Cincinnati, Sandusky and Cleveland R. R.—Company (till May 1; leased to L. B. & W.) .....	b 175,903 82	7,003 47	a	a	25,731 00	6 00	10,191 36	\$110,276 48
Columbus, Springfield and Cincinnati R. R. (till May 1; leased to L. B. & W.) .....	70,000 00	a	a	a	a	a	a	a
Cincinnati, Van Wert and Michigan R. R. (by C. V. W. & M. C. C. Co. from March 5; construction contract).....	a	a	a	a	a	a	a	a
Cincinnati and Westwood R. R.—Company .....	a	a	a	a	a	a	a	a
Cleveland, Columbus, Cincinnati and Indianapolis R'y—Company.....	436,298 34	a	749,540 00	5 00	a	a	67,000 00	421,000 00
Cincinnati and Springfield R'y (under lease).....	185,779 98	a	a	a	a	a	a	a

TABLE XXVI.—INTEREST AND DIVIDENDS—Continued.

Name, and how operated.	Interest—		Dividends on stock.				Applied to—	
	On bonds.	On floating debt.	General.	Per cent.	Preferred.	Per cent.	Cancelling bonds or sinking fund.	Liquidation of floating debt.
Cleveland and Marietta R. R.—Company.....	a	a	a	a	a	a	a	a
Cleveland, Mt. Vernon and Delaware R. R.—Receiver.....	a	a	a	a	a	a	a	a
Cleveland, Fairview and Ashabula R. R.—Company.....	Not reported.	16,476 90	a	a	a	a	a	a
Cleveland, Tuscarawas Valley and Wheeling R'y.—Company.....	49,000 00	a	a	a	a	a	a	a
College Hill R. R.—Company (from May 1, 1881).....	a	246 85	185,062 00	a	a	a	49,800 00	a
Columbus and Hocking Valley R. R.—Company.....	175,000 00	a	a	a	a	a	a	a
Columbus and Maysville R'y.—Company.....	a	6,513 48	a	a	a	a	a	a
Columbus and Toledo R. R.—Company.....	201,740 00	a	a	a	a	a	a	a
Conotton Valley R'y.—Company.....	a	a	a	a	a	a	a	a
Dayton and Cincinnati R. R.—Receiver (till May 21).....	a	a	a	a	a	a	a	a
Dayton and Southwestern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R.).....	a	a	a	a	a	a	a	a
Dayton and Union R. R.—Trustee.....	34,702 35	13,648 42	a	a	a	a	a	19,185 21
Eastern Ohio R. R.—Lessee.....	28,845 00	a	a	a	a	a	6,000 00	a
Indiana, Bloomington and Western R'y. Co.....	a	a	a	a	a	a	a	a
Col. Springfield and Cleve'd R. R. } Ohio Division (from May 1).....	a	a	a	a	a	a	a	a
Iron R. R.—Company.....	a	a	11,989 50	a	a	a	a	a
Lake Erie and Western R'y.—Company.....	2,629,415 00	a	a	a	a	a	1,627,000 00	8,679 44
Lake Shore and Michigan Southern R'y.—Company.....	a	a	3,957,320 00	8.00	53,350 00	10.00	250,000 00	a
Chicago and Canada Southern R'y (by stock ownership and special agreement).....	a	a	a	a	a	a	a	a
Mahoning Coal R. R. (under lease).....	177,870 00	a	a	a	a	a	a	a
Marietta and Cincinnati R. R.—Receiver.....	104,020 00	a	a	a	a	a	a	a
Baltimore Short Line R'y (special agreement).....	a	a	a	a	a	a	a	a
Cincinnati and Baltimore R'y (special agreement).....	a	a	a	a	a	a	a	a
New York, Pennsylvania and Ohio R. R.—Company.....	a	a	a	a	a	a	a	a
Cleveland and Mahoning Valley R'y (under lease).....	2,563,265 00	1,952 76	a	a	a	a	a	a
Ohio Central R. R.—Company.....	80,966 50	a	262,067 00	9.50	a	a	a	a
Ohio and Mississippi R'y.—Receiver.....	117,040 00	a	a	a	a	a	a	a
Ohio and West Virginia R'y.—Receiver.....	1,107,120 10	16,988 89	a	a	a	a	a	a
Painesville, Canton and Bridgeport N. G. R. R.—Company and Receiver (till February 1; sold to C. F. and S.).....	61,687 50	a	a	a	a	a	6,000 00	145,969 17
Painesville and Youngstown R'y.—Company.....	a	a	a	a	a	a	a	a

[illegible]

a. None reported.

**c Includes interest on Receiver's certificates.**

### 3. Floating debt of Receiver.

On guaranteed special stock.





TABLE XXVII.—CASUALTIES TO PERSONS IN OHIO—Continued.

Name, and how operated.	Passengers.				Employees.				Others.				Totals.		
	Causes beyond their own control.		Their mis-conduct or want of caution.		Causes beyond their own control.		Their mis-conduct or want of caution.		On track and trespassing, etc.		At stations and high-way crossings.		Stealing rides.		
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	
Tol., Can. South'n & Detroit R'y (by C. S. R'y Co.; st'k ownership) .....	.....	.....	.....	.....	1	.....	.....	8	.....	2	.....	1	.....	1	1
Toledo, Delphos & Burlington R.—Company .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
Valley Railway—Company .....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Wabash, St. Louis & Pacific R'y—Company .....	1	49	6	32	1	6	1	.....	.....	.....	.....	.....	1	.....	6
Totals .....	1	49	6	32	39	102	72	338	112	74	27	24	33	35	654

(a) No casualties to persons reported.



TABLE XXVIII.—SUMMARY OF ACCIDENTS—PERSONS KILLED.

[illegible]



	8	3	25	31	.....	10	10	20	.....	22	8	29	1	8	3	7	1	11	.....	12
Pittsburgh, Ft. Wayne and Chicago R'y (under lease).....				3	3	.....		1	1	.....				2	2	.....	1	1	.....	2
Pittsburgh, Cincinnati and St. Louis R'-Company.....	None	re	po	re	d.	.....				1	.....			1	.....			.....		
Cincinnati and Miami Valley R'y (under lease).....	Included	1	.....		M.	.....												.....		
Columbus, Chicago and Milan-Charara R'y (under lease).....	Included	2	.....			.....		1	2	3	.....							.....		
Columbus and Xenia R. R. (under lease).....	None	re	po	re	d.	.....												.....		
Little Miami R'y (under lease).....	None	re	po	re	d.	.....												.....		
Pittsburgh and Lake Erie R. R.—Company.....	None	re	po	re	d.	.....												.....		
Rocky River R. R.—Company.....	None	re	po	re	d.	.....												.....		
Sacato Valley R'y—Company.....	None	re	po	re	d.	.....												.....		
Springfield Southern R. R.—Company.....	None	re	po	re	d.	.....												.....		
St. Clairsville and Northern R'y—Company.....	None	re	po	re	d.	.....												.....		
St. Clairsville R'y—Company.....	None	re	po	re	d.	.....												.....		
Toledo, Ann Arbor and Grand Trunk R'y—Company (from October 15)	None	re	po	re	d.	.....												.....		
Toledo, Canada Southern and Detroit R'y (by C. S. Ry Co.; stock ownership)	None	re	po	re	d.	.....												.....		
Toledo, Delphos and Burlington R. R.—Company.....	None	re	po	re	d.	.....												.....		
Valley Railway—Company.....	None	re	po	re	d.	.....												.....		
Wabash, St. Louis and Pacific R'y—Company.....	None	re	po	re	d.	.....												.....		
Totals.....	8	3	25	31	.....	10	10	20	.....	22	8	29	1	8	3	7	1	11	.....	12



[illegible]

TABLE XXVIII.—SUMMARY OF ACCIDENTS—PERSONS KILLED—Continued.

Name, and how operated.	Engine or train leaving or thrown from track.			Coupling, or crushed betw'n cars and engine			Riding or driv- ing across track.			Lying, walking, falling, or being on track.			Explosion or capsizing of engines.		
	Passeng'rs.	Emploves.	Others.	Total.	Passeng'rs.	Emploves.	Others.	Total.	Passeng'rs.	Emploves.	Others.	Total.	Passeng'rs.	Emploves.	Others.
St. Clairsville R'y—Company.....	None.	None	reported.												
Toledo, Ann Arbor and Grand Trunk R'y—Company (from October 15).....															
Toledo, Canada Southern and Detroit Railway (by C., S. R'y Co.; stock owner- ship).....															
Toledo, Delphos and Burlington R. R.—Company.....															
Valley Railway—Company.....															
Wabash, St. Louis and Pacific R'y—Company.....															
Totals.....	2	5	7	15	15	1	1	25	25	22	95	117			



TABLE XXVIII.—SUMMARY OF ACCIDENTS—PERSONS KILLED—Continued.

Name, and how operated.	On hand cars—falling from or struck by engine.				Catching foot in frog or between rails—Run over.				Suicide.				Miscellaneous.				Totals.			
	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.				
Alliance and Lake Erie Railroad—Company .....																				
Baltimore and Ohio Railroad Company—																				
Baltimore and Ohio and Chicago Railroad (stock ownership)																				
Central Ohio Railroad (under lease).....																				
Central, Somerset and Straitsville Railroad (under lease).....																				
Sandusky, Mansfield and Newark Railroad (under lease).....																				
Sandusky and Northwestern Railway—Company .....																				
Bellaire and Green Railroad—Company .....																				
Bowling Green Railroad—Company .....																				
Cel., Van Wert & S. L. R'y—Co. (till Mar. 5; sold then to C., V. W. & M. R.R. Co.)																				
Chagrin Falls and Southern Railroad—Company (from February 1, 1881) .....																				
Cincinnati and Eastern Railway—Company .....																				
Cincinnati, Georgetown and Portsmouth Railroad—Co. ....																				
Cincinnati, Hamilton and Dayton Railroad—Company .....																				
Cincinnati, Hamilton and Indianapolis Railroad (stock ownership).....																				
Cincinnati, Richmond and Chicago Railroad (lease) .....																				
Dayton and Michigan Railroad (lease) .....																				
Cincinnati, Indianapolis, St. Louis & Chicago R'y—Co .....																				
Harrison Branch Railroad (under lease) .....																				
Cincinnati Northern Railway—Company .....																				
Gin. and Portsmouth R.R.—Receiver (till Sept. 13; sold to C., G. & P. R. Co.)																				
Cincinnati, R. R. Co. ....																				
Cincinnati Southern Railway (under license) .....																				
Cincinnati Sandusky & Cleveland R. R. Co. (till May 1; leased to I. B. & W.)																				
Col. Springfield and Cincinnati Railroad (till May 1; leased to I. B. & W.)																				
Gin., Van Wert & Mich. R. R. (V. W. & M.C. Co. from Mar. 5; constr'n contr't)																				
Cincinnati and Westwood Railroad—Company .....																				
Cleveland, Columbus, Cin. & Indianapolis R'y—Co .....																				
Cincinnati and Springfield Railway (under lease) .....																				
Cleveland and Marietta Railroad—Company .....																				
Cleveland, St. Verdon and Delaware R. R.—Receiver .....																				
Cleveland, Palmsville and Ashtabula Railroad—Co. ....																				
Cleveland, Tuscarawas Valley and Wheeling R'y—Co .....																				
College Hill Railroad—Company (from May 1, 1881) .....																				
Columbus and Hocking Valley Railroad—Company .....																				
Columbus and Naysville Railway—Company .....																				
Columbus and Toledo Railroad—Company .....																				



[illegible]



Cleve, Painesville & Ashabula R. R.—Company.....	Not reported.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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TABLE XXIX.—SUMMARY OF ACCIDENTS—PERSONS INJURED—Continued.

Name, and how operated.	Getting on or off engine or train in motion.				Driving or riding across track.				Struck by bridge, chute or other obstruction.				Coupling or caught between car and engine—employees.				Falling or thrown from engine or train.			
	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.
Toledo, Canada Southern & Detroit R'y (by C. S. R'y Co.; stock ownership).....			1	1																
Toledo, Delphos & Burlington R. R.—Company.....							1	1										3		3
Valley Railway—Company.....																				
Wabash, St. Louis & Pacific R'y—Company.....																				
Totals.....	23	20	31	74			23	23		2	26	28		2	61	6	3	3		70

(a) 7 were not employees, but others, viz.: 1, Columbus & Toledo R. R.; 1, N. Y., P. & O. R. R.; 3, Cleveland & Pittsburgh R. R.; 1, P., C. & St. L. R'y; and 1, C., C. & I. C. R'y.



TABLE XXIX.—SUMMARY OF ACCIDENTS—PERSONS INJURED—Continued.

[illegible]

TABLE XXIX—SUMMARY OF ACCIDENTS—PERSONS INJURED—Continued.

Name, and how operated.	Falling between cars.				Lying, walking, falling, or being on track.				Collisions.				Run over in yard on siding or switching.			
	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.
Cleveland, Tuscarawas Valley & Wheeling R'y—Co.																
College Hill R. R.—Company (from May 1, 1881)	None.								1							
Columbus & Hocking Valley R. R.—Company																
Columbus & Maysville R'y—Company	None.								1							
Columbus & Toledo R. R.—Company	None.															
Columbus, Washington & Cin. R. R.—Receiver (till May 21)	None.															
Cornett Valley R'y—Company	None.															
Dayton & Southeastern R. R.—Receiver (till May 21; then consolidated with T. D. & B. R. R.)	None.	reported.														
Dayton & Union R. R.—Trustee	"	"	"													
Eastern Ohio R. R.—Lessee																
Indiana, Bloomington & Western R'y (under lease)																
Col., Sandusky & Cleve. R. R. } Ohio div. (from May 1)																
Col., Springfield & Cin. R. R. }																
Iron R. R.—Company																
Lake Erie & Western R'y—Company																
Lake Shore & Mich. Southern R'y—Company	1			1												
Chicago & Canada Southern R'y (by stock ownership and special agreement)																
Mahoning (and R. R. (under lease)	None reported.															
Marietta & Cincinnati R. R.—Receiver	Included in L. S. & M. S.															
Baltimore & Annapolis R'y (special agreement)	Included in M. & C.															
Cincinnati & Baltimore R'y (special agreement)	"															
New York, Pennsylvania & Ohio R. R.—Company	Included in N. Y. P. & O.															
Cleveland & Mahoning Valley R'y (under lease)	Included in N. Y. P. & O.															
Ohio Central R. R.—Company	1															
Ohio & Mississippi R'y—Receiver																
Ohio & West Virginia R'y—Company																
Painesville, Canton & Bridgeport N. G. R. R.—Company and Receiver (till Feb. 1; sold to C. P. & S.)	None reported.															
Painesville & Youngstown R'y—Company	None.															
Panduit & Cecil R'y—Company																
Pennsylvania Company																
Ashabula & Pittsburgh R'y (under lease)	None.															
Cleveland & Pittsburgh R. R. (under lease)																

[illegible]



Cleveland, Tuscarawas Valley and Wheeling Railway—Co.	None		4				1
College Hill Railroad—Company (from May 1, 1881)	None						1
Columbus and Hocking Valley Railroad—Company	None						
Columbus and Maysville Railway—Company	None						
Columbus and Toledo Railroad—Company	None						
Columbus, Washington and Cin. R. R.—Receiver (till May 21)	None						
Cornett Valley Railway—Company	None						
Dayton and Southern Railroad—Receiver (till May 21; then consolidated with T. D. & B. Railroad)	None						
Dayton and Union Railroad—Trustee	None						
Eastern Ohio Railroad—Lessee	None						
Indiana, Bloomington and Cleve. R. R. } Ohio Division (from May 1)	None						
Col., Springfield and Cin. R. R. }	None						
Iron Railroad—Company	None						
Lake Erie and Western Railway—Company	None						
Lake Shore and Michigan Southern Railway—Company	None						
Chicago and Canada Southern Railway (by stock ownership and special agreement)	None						
Mahoning Coal Railroad (under lease)	None						
Marietta and Cincinnati Railroad—Receiver	None						
Baltimore and Short Line Railway (special agreement)	None						
Cincinnati and Baltimore Railway (special agreement)	None						
New York, Pennsylvania and Ohio Railroad—Company	None						
Cleveland and Mahoning Valley Railway (under lease)	None						
Ohio Central Railroad—Company	None						
Ohio and Mississippi Railway—Receiver	None						
Ohio and West Virginia Railway—Company	None						
Painesville, Canton and Bridgeport N. G. Railroad—Company	None						
and Receiver (till Feb'y 1; sold to C. F. & S.)	None						
Painesville and Youngstown Railway—Company	None						
Pauhalling and Cecil Railway—Company	None						
Pennsylvania Company—	None						
Ashtabula and Pittsburgh Railway (under lease)	None						
Cleveland and Pittsburgh Railroad (under lease)	None						
Lawrence Railroad (under lease)	None						
Massillon and Cleveland Railroad (under lease)	None						
North Western Ohio Railway (under lease)	None						
Pittsburgh, Ft. Wayne and St. Louis Railway—Company	None						
Cincinnati and Muskingum Valley Railway (under lease)	None						
Cincinnati and Indiana Central R'y (under lease)	None						
Columbus, Chicago and Indiana Central R'y (under lease)	None						
Columbus and Xenia Railroad (under lease)	None						
Little Miami Railway (under lease)	None						
Pittsburgh and Lake Erie Railroad—Company	None						
Rocky River Railroad—Company	None						
Scioto Valley Railway—Company	None						
Springfield Southern Railroad—Company	None						
St. Clairsville and Northern Railway—Company	None						
St. Clairsville Railway—Company	None						
Toledo, Ann Arbor and Grand Trunk Railway—Company (from October 15)	None						

TABLE XXIX.—SUMMARY OF ACCIDENTS—PERSONS INJURED—Continued.

Name, and how operated.	Run over, catching foot in frog or between rails.			Engine or train leaving or thrown from track.			Broken axle, and exploded or capsized engine.			On hand-car, or struck by engine.		
	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.	Passengers.	Employees.	Others.	Total.
Toledo, Canada Southern and Detroit Railway (by C. S. Railway Company; stock ownership).												
Toledo, Delphos and Burlington Railroad—Company.						2		2				
Valley Railway—Company.												
Wabash, St. Louis and Pacific Railway—Company.												
Totals	9	1	10	29	14	15		9	19	2		22



TABLE XXIX.—SUMMARY OF ACCIDENTS—PERSONS INJURED—Continued.

[illegible]



Massillon and Cleveland R. R. (under lease)	None																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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TABLE XXX.—RAILWAY LINES IN PROGRESS.

Number.	Name.	Length—miles.		Capital stock.		Debt.		Amount expended for construction.
		Proposed.	Graded.	Authorized.	Subscribed.	Paid in.	Funded.	
1	Chicago and Atlantic Railway Co.....	432.00	.....	\$10,000,000 00	.....	.....	\$6,500,000 00	.....
2	Cincinnati, Hocking Valley and Huntington R'y Co.....	150.00	18.00	5,250,000 00	\$806,000 00	\$31,298 98	.....	\$40,161 14
3	Columbus, Jeffersonville and Cincinnati Railway Co.....	154.00	16.50	400,000 00	58,850 00	17,277 53	.....	28,677 02
4	Connocton Valley and Straitsville Railroad Co.....	a	a	800,000 00	519,056 85	472,980 57	1,200,000 00	526,392 69
5	Martin's Ferry and Bellare Railway Co.....	a	6.93	50,000 00	36,000 00	52 00	.....	40 50
6	Michigan and Ohio Railway Co.....	400.00	a	15,000,000 00	.....	14,900 00	200,000 00	39,508 11
7	Steubenville, Canton and Cleveland Railway Co.....	a	a	300,000 00	30,050 00	8,859 84	.....	40,121 72
8	Wheeling and Lake Erie Railroad Co.....	223.00	50.00	5,250,000 00	.....	172,895 00	81,000 00	438,891 51
Totals.....		1,365.93	84.50	\$37,110,000 00	\$1,449,956 85	\$718,363 92	\$7,984,000 00	\$1,113,792 69

a Not given.

TABLE XXXI.—CINCINNATI INCLINED PLANE RAILWAYS.

Name.	Length—miles.		Capital stock.		Debt.		Cost of construction and equipm't.	
	Of plane.	Of street railway.	Authorized.	Subscribed.	Paid in.	Funded.	Other.	Total.
Cin'nati and Clifton Inclined Plane R.R. Co.	34	3.00	\$300,000 00	a	a	.....	.....	\$167,173 99
Cincinnati Inclined Plane Railway Co.....	50	b 3.04	50,000 00	a	\$10,050 00	\$125,000 00	\$83,035 13	147,274 66
Mt. Adams and Eden Park Inc. Plane R'y Co.	18	b 3.75	1,000,000 00	\$769,550 00	769,550 00	300,000 00	a	367,069 72
Price Hill Inclined Plane Railway Co.....	c .30	.....	.....	.....	.....	.....	.....	32,430 00
Totals.....	1.32	9.75	\$1,350,000 00	\$769,550 00	\$779,600 00	\$425,000 00	\$84,138 86	\$713,948 37

a Not given. b Double track. c From report of 1880.

TABLE XXXII.—PRIVATE RAILROADS.

	Name.	Length in miles.	Cost of construction and equipment.			Used for what purpose.
			Construction.	Equipment.	Total.	
	Antwerp and Puckerbrush Railroad	3.50	a	a	\$12,000 00	Transporting wood.
	Haydensville Branch Railroad	a	\$600 00	\$106,800 00	107,400 00	coal.
	Salineville Branch Railroad	3.50	30,000 00		30,000 00	"
	Sheridan Mining Company's Railroad	1.13	a	670 00	a	"
	Youngstown and Austintown R. R. way	3.10	a	a	a	"
Totals		11.23	\$30,600 00	\$107,470 00	\$149,400 00	

a Not given.

TABLE XXXIII.—RAILROAD COMPANIES WHOSE CAPITAL STOCK HAS BEEN INCREASED, FROM JAN. 1, 1880, TO NOV. 15, 1881.

Date of filing certificate.	Name of Company.	Amount increased.	Present amount of capital stock.
1880.			
June 2	The Cincinnati Railroad Company	\$100,000 00	\$1,100,000 00
July 7	The Cincinnati, Fayetteville, Hillsboro and Huntington Railway Company	4,500,000 00	5,250,000 00
August 8	The Scioto Valley Railway Company	500,000 00	2,500,000 00
August 16	The Springfield, St. Paris and Sidney Railroad Company	1,000,000 00	1,800,000 00
September 13	The Columbus and Maysville Railway Company	2,650,000 00	3,000,000 00
October 13	The Cincinnati Railroad Company	900,000 00	2,000,000 00
November 2	The Chicago and Atlantic Railway Company	3,000,000 00	10,000,000 00
November 15	The Ohio Central Railroad Company	400,000 00	4,400,000 00
1881.			
January 19	The Ohio Central Railroad Company	7,600,000 00	12,000,000 00
March 26	The Island Creek and Richmond Mineral Railroad Company	300,000 00	300,000 00
June 15	The Columbus and Hocking Valley Railroad Company	2,500,000 00	5,000,000 00
June 21	The Newark, Somerset and Strattsville Railroad Company (preferred stock)	30,000 00	1,016,950 00
July 18	The New York, Pittsburgh and Chicago Railway Company	4,440,000 00	4,740,000 00
July 20	The Cincinnati and Ohio River Railway Company	5,000,000 00	6,000,000 00
September 24	The Miami Valley and Columbus Railway Company	500,000 00	1,000,000 00
October 3	The Cleveland, Delphos and St. Louis Railroad Company	2,950,000 00	3,000,000 00
November 7	The Belaire and Southwestern Railway Company	1,100,000 00	3,000,000 00

TABLE XXXIV.—NAMES OF RAILROAD COMPANIES INCORPORATED, WITH DATE OF FILING CERTIFICATE, TERMINI, COUNTIES THROUGH WHICH THE ROADS ARE TO PASS, AND AMOUNT OF CAPITAL STOCK, FROM JANUARY 1, 1880, TO NOVEMBER 15, 1881.

Number	Name of Company.	Counties through which roads pass.	Termini.	Date of certificate.	Capital stock.	Number
1	The Lake Erie & Shenango Valley R. R. Co.....	Ashtabula, Trumbull	Conneaut and Vernon Center.....	1880	\$1,000,000	1
2	The Columbus, Findlay & Northwestern R'y Co.....	Franklin, Delaware, Union, Marion, Hardin, Wood, Wyandot, Hancock, Henry, Fulton, Williams.....	Columbus and North State line in Williams county.....	January 15		
3	The Ryan & Baltimore R. R. Co.....	Defiance, Williams.....	Delaware Bend and Bryan.....	27	1,000,000	2
4	The Bellefontaine, Troy & Indian R'y Co.....	Logan, Champaign, Miami, Montgomery, Preble, Butler.....		29	100,000	3
5	The Columbus, Findlay & Northwestern R'y Co.....	Franklin, Delaware, Union, Marion, Wyandot, Hardin, Hancock, Wood, Henry, Fulton, Williams.....	Bellefontaine and College Corners	February 12	10,000	4
6	The Dayton & Southwestern R. R. Co.....	Montgomery, Preble.....	Columbus and North State line in Williams county.....	18	50,000	5
7	The Twin Valley & Greenville R'y Co.....	Warren, Montgomery, Preble, Darke, Stark, Summit, Portage, Cuyahoga, Lake, Geauga.....	Dayton and College Corners.....	8	100,000	6
8	The Connocton Northern R'y Co.....	Shelby, Auglaize.....	Carlisle and Greenville.....	13	200,000	7
9	The Sidney & St. Mary's R. R. Co.....	Stark, Carroll, Harrison, Jefferson, Belmont.....	Canton and Fairport Harbor.....	23	2,000,000	8
10	The Alliance & Ohio River R. R. Co.....	Allen, Van Wert, Putnam, Paulding, Fulton, Williams.....	Sidney and St. Mary's.....	6	50,000	9
11	The Delphos & Paulding R'y Co.....	Miami, Clarke.....	Alliance and Ohio river in Belmont county.....	April		
12	The Northwestern Ohio R. R. Co.....	Hamilton, Warren.....	Delphos and Paulding Center.....	17	50,000	10
13	The Springfield & Clinton R'y Co.....	Carroll, Tuscarawas.....	North State line in Fulton county and west line in Williams county	21	60,000	11
14	The Cincinnati, Walnut Hills, Avondale & Union Village R. R. Co.....	Erie, Huron, Lorain, Medina.....	Piqua and Springfield.....	18	300,000	12
15	The Mineral Valley R. R. Co.....	Cuyahoga, Summit, Stark, Carroll, Harrison, Belmont, Lake, Geauga.....	Springfield Station and Clinton.....	24	5,000	13
16	The Lake Erie & Eastern R'y Co.....	Ashtabula, Lake, Cuyahoga, Lorain, Huron, Erie, Sandusky, Ottawa, Wood, Lucas, Fulton, Williams.....	June 8	30,000	14	
17	The Chagrin Falls & Southern R. R. Co.....	Lucas, Fulton, Williams.....	Cincinnati and Union Village.....	2	100,000	15
18	The Buffalo, Cleveland & Chicago R'y Co.....	Hamilton, Butler.....	Dell Roy and Zour Station.....	9	150,000	16
19		Clarke, Miami, Darke.....	Sandusky and Lodi.....	August 13	1,500	17
20	The Central Valley R. R. Co.....	Montgomery, Preble.....	Month of Chagrin river and Bridgeport.....	September 30	40,000	18
21	The Cincinnati & Indianapolis R. R. Co.....	Lucas, Ottawa, Sandusky, Erie, Lorain, Lake, Cuyahoga, Geauga, Ashtabula, Lucas, Fulton, Williams.....	Buffalo and Chicago.....	October 16	6,500,000	19
22	The Springfield & Indianapolis R. R. Co.....	Franklin, Madison, Clarke, Miami, Darke.....	Wellston and Scott and Thornhills Coal Works.....	22	5,000	20
23	The Dayton, Evansville & Southwestern R'y Co.....	Preble, Montgomery.....	Cincinnati and Philanthropy.....	30	1,000,000	21
24	The South Shore R'y Co.....	Lucas, Cuyahoga, Geauga, Ashtabula, Lucas, Fulton, Williams.....	Springfield and Samsco.....	30	1,500,000	22
25	The Toledo & Ohio Northern R'y Co.....	Franklin, Madison, Clarke, Miami, Darke.....	Dayton and State line.....	30	50,000	23
26	The Ohio & Indiana Northern R'y Co.....	Franklin, Madison, Clarke, Greene, Preble, Montgomery.....	Toledo and east State line.....	November 11	2,000,000	24
27	The Ohio & Western R'y Co.....		Toledo and west State line.....	13	1,050,000	25
			Columbus and Hollansburgh.....	13	2,250,000	26
			Columbus and west State line.....	13	2,250,000	27



TABLE XXXIV.—RAILROAD COMPANIES INCORPORATED—Continued.

Number.	Name of company.	Counties through which railroads pass.	Termini of road.	Date of filing articles of incorporation.	Date of filing certificate of incorporation to capital stock.	Amount of capital stock.	Number.
28	The Ohio Western Railroad Co.....	Logan, Champaign, Miami, Montgomery, Preble and Shelby .....	College Corner and Bellefontaine Cincinnati and West Virginia.....	1880. Nov. 23 Dec. 3	..... Oct. 1	\$10,000	28
29	The Baltimore, Cincinnati and Western R'y Co.,	Preble and Shelby .....	College Corner and Bellefontaine Cincinnati and West Virginia.....	Nov. 23 Dec. 3	..... Oct. 1	1,000,000	29
30	The Baltimore, Cincinnati and Western Central Railway Co.....	Gallia, Jackson, Lawrence, Scioto, Adams, Brown, Clermont and Hamilton .....	Cincinnati and West Virginia.....	7	..... Jan. 31	1,000,000	30
31	The Cincinnati Central Railway Co.....	Hamilton .....	Near Winton Place and Cja. Tp... Cincinnati.....	8 Feb. 19	..... Feb. 19	1,000,000	31
32	The Cincinnati Belt Railway Co.....	Hamilton .....	Cincinnati.....	1881.	.....	1,000,000	32
33	The Lake Erie, Alliance and Ohio River R. Co.	Stark, Carroll, Harrison, Jefferson and Belmont .....	Alliance in Stark county and in Belmont county.....	Jan. 22	.....	50,000	33
34	The Cincinnati, Van Wert and Michigan R. R. Co.	Hamilton, Preble, Butler, Darke, Mercer, Van Wert, Paulding, Delaware and Williams.....	Hillsdale in Michigan and Cincinnati, Ohio.....	24 Mar. 11	..... Mar. 11	2,000,000	34
35	The Cleveland, Ellio and Southern R. R. Co.....	Wayne, Medina and Cuyahoga.....	Ellio and Cleveland.....	24 May 4	..... May 4	50,000	35
36	The Lima and Western Railway Co.....	Allen, Van Wert and Mercer.....	Lima and near Willshire.....	24 May 4	..... May 4	5,000	36
37	The Youngstown, Akron and Western R. R. Co.	Mahoning, Portage, Summit, Medina, Huron, Seneca, Hancock, Putnam and Paulding .....	Youngstown and in Harrison county .....	Feb. 2	.....	500,000	37
38	The Cincinnati, Avondale & Spring Grove R'y Co.	Mahoning, Trumbull, Portage, Summit, Medina, Ashland, Lorain, Huron, Seneca, andusky and Wood .....	Cincinnati and Spring Grove Cemetery.....	7	.....	500,000	38
39	The Pittsburgh, Youngstown & Chicago R. R. Co.	Stark, Mahoning and Trumbull .....	Poland tp., Mahoning county, and Toledo .....	8 Mar. 22	..... Mar. 22	2,000,000	39
40	The Alliance, Niles and Ashabula Railway Co.....	Stark, Mahoning and Trumbull .....	Alliance and Niles.....	10	.....	400,000	40
41	The Spring Grove, Avondale and Cincinnati Railway Co.....	Hamilton and Butler county .....	Cincinnati and Venice.....	12 Mar. 21	..... Mar. 21	1,000,000	41
42	The New York and Chicago Railway Co.....	Hamilton and Butler county .....	Western boundary of the State of Ohio, Ashabula and Paulding county .....	18 April 4	..... April 4	12,000,000	42
43	The Canton and Canal Dover R. R. Co.....	Tuscarawas and Stark.....	Canton and Canal Dover.....	23	.....	750,000	43
44	The Dayton and Cincinnati R. R. Co.....	Montgomery and Warren.....	Dayton and Lebanon .....	Mar. 5	.....	500,000	44
45	The New York, Pittsburgh and Chicago R'y Co.	Stark, Holmes, Richland, Morrow, Marion, Allen, Putnam, Hancock, Seneca, Huron, Ashland, Medina and Cuyahoga.....	Dayton and Lebanon .....	5	.....	300,000	45
46	The Cleveland, Delphos and St. Louis R. R. Co.	Ashland, Medina and Cuyahoga.....	Cleveland .....	9 April 20	..... April 20	50,000	46

TABLE XXXIV.—RAILROAD COMPANIES INCORPORATED—Continued.

Number.	Name of company.	Countries through which railroads pass.	Termini of road.	Date of filing articles of incorporation.	Date of filing certificate of incorporation to stock.	Amount of capital stock.	Number.
47	The Sandusky, Ashland, Milersburgh & Straitsville Railway Co.	Erie, Huron, Ashland, Holmes, Coshocton, Muskingum and Perry	Sandusky and Straitsville	1881. Mar. 9	.....	\$200,000	47
48	The Alliance, Niles and Ashland R. R. Co.	Stark, Mahoning and Trumbull	Alliance and Niles	.....	July 18	500,000	48
49	The Ripley and Russellville R. R. Co.	Brown	Ripley and Russellville	.....	.....	80,000	49
50	The Cincinnati Union R. R. Co.	Hamilton	Cincinnati	.....	.....	3,000,000	50
51	The Ironton and Huntington R. R. Co.	Lawrence	Ironton and Huntington	.....	.....	300,000	51
52	The Cincinnati Union & Northwestern R. R. Co.	Montgomery	Germanatown and Dodson	.....	.....	300,000	52
53	The Toledo, Cleveland and Detroit R. R. Co.	Lucas	Germanatown and Dodson	.....	May 19	300,000	53
54	The Cincinnati, Van Wert and Michigan Common Carrier Co.	Van Wert, Paulding, Defiance, Williams, Hamilton, Butler, Probler, Darke, Mercer, Cuyahoga, Summit, Portage, Trumbull and Mahoning	Hilldale, Mich., and Bryan, O.	.....	.....	50,000	54
55	The Cleveland, Youngstown & Pittsburgh R'y Co.	Franklin, Union, Logan, Anglatze, Allen and Van Wert	Cleveland and Mahoning county	April 2	June 1	1,000,000	55
56	The Columbus, Wapakoneta and Northwestern Railway Co.	Lucas, Wood, Hancock, Hardin, Allen, Anglatze, Mercer, Shelby and Darke	Columbus and Van Wert	.....	.....	200,000	56
57	The Toledo and Indianapolis R. R. Co.	Mahoning, Cuyahoga, Carroll and Tuscarawas	Toledo and Darke county	.....	July 14	2,000,000	57
58	The Youngstown and Salineville Railway Co.	Wayne	Youngstown and Canal Dover	May 4	June 15	500,000	58
59	The Wooster and Lake Erie Railway Co.	Cuyahoga, Linn, Summit, Huron, Ashland, Seneca, Hancock, Putnam, Medina, Erie, Richland, Crawford, Wyandot and Van Wert	Wooster and Russell	.....	.....	60,000	59
60	The Cleveland, Ottawa & Northwestern R. R. Co.	Franklin, Pickaway, Madison, Greene, Clinton and Warren	Cleveland and Van Wert county	.....	June 14	200,000	60
61	The Paulding and New York R. R. Co.	Muskingum, Chertsey, Morgan and Noble	Paulding county	.....	.....	20,000	61
62	The Columbus and Cincinnati R. R. Co.	Medina, Summit, Portage, Geauga and Trumbull	Columbus and Lebanon	.....	.....	1,000,000	62
63	The Zanesville and Southeastern Railway Co.	Hamilton, Clermont, Brown, Adams, Seloto and Lawrence	Zanesville and Caldwell	.....	Sept. 24	500,000	63
64	The New York, Ohio and Western R. R. Co.	Hamilton, Clermont, Brown, Adams, Seloto and Lawrence	Medina and in Trumbull county	.....	.....	50,000	64
65	The Cincinnati and Ohio River Railway Co.	Franklin, Fairfield, Hocking and Perry	Cincinnati and Lawrence county	June 7	July 13	1,000,000	65
66	The Hocking Coal and Columbus R. R. Co.	Hamilton and Butler	Columbus and Hocking county	.....	.....	600,000	66
67	The Cincinnati Reading and Sharon Railway Co.	Defiance, Paulding and Van Wert	Hamilton	.....	.....	30,000	67
68	The Defiance, Paulding and Van Wert R'y Co.	Defiance, Adams, Brown, Clermont and Hamilton	Defiance and Van Wert	.....	.....	200,000	68
69	The Portsmouth and Cincinnati Railway Co.		Portsmouth and Cincinnati	.....	.....	500,000	69

70	The Middletown and East End R. R. Co.	Butler	Middletown	June 24	10,000	70
71	The Youngstown and State Line R. R. Co.	Mahoning	Youngstown	July 5	100,000	71
72	The Dayton and Hocking Valley R. R. Co.	Montgomery, Greene, Fayette, Pickaway, Hocking, Union and Meigs	Dayton and Pomeroy	Oct. 7	50,000	72
73	The Dayton Belt R. R. Co.	Montgomery	Dayton	22	50,000	73
74	The Cleveland Terminal Railway Co.	Cuyahoga	Rockport and Euclid Creek	Oct. 15	2,000,000	74
75	The Mound Creek Railway Co.	Perry, Athens and Hocking	Shawnee and in the line of the O. C. R. R.	Aug. 1	1,000,000	75
76	The Buffalo, Baltimore and Ohio R. R. Co.	Huron, Richmond, Ashland, Wayne, Stark, Summit, Portage and Mahoning	Eastern boundary of Ohio and Mahoning county	2	750,000	76
77	The Chesapeake, Columbus and Chicago R'y Co.	Lawrence, Seido, Pike, Ross, Pickaway, Franklin, Madison, Union, Champaign, Logan, Shelby, Auglaize, Hardin, Allen, Mercer and Van Wert	Pomeroy and near the boundary of Ohio	3 Oct. 28	1,000,000	77
78	The Pomeroy and Ohio River R. R. Co.	Meigs and Gallia	Corning and near the boundary of Ohio	18 Nov. 11	500,000	78
79	The Central and Ohio River R. R. Co.	Perry, Meigs and Gallia		31	1,500,000	79
80	The Cincinnati, Germantown and Northwestern R. R. Co.	Warren and Montgomery	Carlisle Station and Dodson	Sept. 2	300,000	80
81	The Cincinnati, New Orleans and Texas Pacific Railway Co.	Capron Carrier Company		8 Oct. 10	3,000,000	81
82	The Cincinnati Carrier Co.	Common Carrier Company		8	12,000	82
83	The Ohio Mineral R. R. Co.	Perry, Athens, Meigs and Gallia	McConnallyville and Portsmouth	12	10,000	83
84	The Central and Ohio River R. R. Co.		Corning and line near W. Va.	15	1,500,000	84
85	The Cincinnati, Hillsborough and Baltimore R. R. Co.	Hamilton, Clermont, Brown, Highland, Pike, Seido, Jackson and Gallia	Cincinnati and Gallipolis	22	1,000,000	85
86	The Piqua and Troy Branch R. R. Co.	Miami and Shelby	Troy	Oct. 1	200,000	86
87	The Ironton and Northeastern R. R. Co.	Lawrence and Gallia	Ironton and Gallipolis	5	1,000,000	87
88	The Lake Erie, Wooster and Muskingum Valley R. R. Co.	Lorain, Cuyahoga, Medina, Wayne, Holmes, Coshocton, Guernsey and Muskingum	Zanesville near Black River township, Lorain county	15	100,000	88
89	The Lima and Columbus Railway Co.	Allen, Auglaize, Hardin, Logan, Champaign, Union, Madison and Franklin	Lima and Columbus	20	2,500,000	89
90	The Toledo, Michigan and Northwestern R. R. Co.	Lucas	Toledo and State Line	Nov. 3	120,000	90
91	The Cincinnati, Columbus and Hocking Valley Railway Co.	Hamilton, Butler, Warren, Clinton, Greene, Fayette, Madison, Pickaway and Franklin	Cincinnati and Columbus	7	2,500,000	91
92	The Canal Dover and Cleveland R. R. Co.	Tuscarawas, Stark, Summit and Cuyahoga	Canal Dover and Cleveland	11	750,000	92
93	The Cleveland Rolling Mill Railway Co.	Bohman, Monroe, Noble, Washington, Morgan, Perry, Athens, Hocking, Ross, Pike, Highland, Brown, Clermont, Hamilton and Vinton	Cleveland	12	500,000	93
94	The Cincinnati, Shawnee and Wheeling R'y Co.			15	3,000,000	94

**TABLE XXXV.—NAMES OF RAILROAD COMPANIES INCORPORATED FOR THE PURPOSE OF EXTENSION OF LINE, WITH DATE OF FILING CERTIFICATE, TERMINI, COUNTIES THROUGH WHICH THE ROADS ARE TO PASS, AND AMOUNT OF CAPITAL STOCK, FROM JUNE 30, 1880, TO NOVEMBER 15, 1881.**

Number.	Name of company.	Termini of road.	Counties through which the rail-roads pass.	Date of filing cer-tificate	Number.
1	The Scioto Valley Railway Co.....	Portsmouth and Ohio river oppo-site Ashland, Kentucky.....	Scioto, Lawrence—extens'n of line.	1880. July 8	1
2	The Springfield, St. Paris and Sidney Railway Co.....	Sidney and State line in Mercer co.	Shelby, Auglaize, Mercer—exten-sion of line.....	Aug. 16	2
3	The Columbus and Maysville Railway Co.....	Washington C. H. and Columbus, Ripley to Aberdeen.....	Fayette, Madis'n, Pickaway, Frank-lin, Brown—extension of termini.	Sept. 6	3
4	The Connotton Northern Railway Co.....	Fairport Harbor and Cleveland.....	Portage, Summit, Cuyahoga—ex-tension of line.....	Oct. 25	4
5	The Mineral Division of the Ohio Central Railroad Co.....	Corning and South Shawnee.....	Perry, Athens—branch road.....	Nov. 15	5
6	The Springfield Southern Railroad Co.....	Jackson and Wellston.....	.....	Jan. 11	6
7	The Wheeling and Lake Erie Railroad Co. (Huron Branch).....	Milan and Government Pier.....	.....	Feb. 11	7
8	The Toledo, Delphos and Burlington Railroad Co.....	Jackson and Ironton.....	Jackson, Gallia and Lawrence.....	May 19	8
9	".....	Dayton.....	Montgomery and Warren.....	April 15	9
10	The Wheeling and Lake Erie Railroad Co.....	Norwalk.....	.....	Aug. 31	10
11	The Valley Railway Co.....	Coal Shuts.....	Summit.....	Sept. 28	11
12	The Crab Creek Branch of the Pittsburgh and Western Railroad Co.....	Crab Creek and Youngstown.....	.....	Oct. 6	12
13	The Valley Railway Co.....	Canton.....	.....	Oct. 29	13

TABLE XXXVI.—RAILROAD COMPANIES CONSOLIDATED, WITH NAME OF CONSOLIDATION, DATE OF FILING ARTICLES OF CONSOLIDATION, AND AMOUNT OF CAPITAL STOCK, FROM JANUARY 1, 1880, TO NOVEMBER 15, 1881.

Names of Consolidating Companies.		Name of Consolidation.	Date of filing articles of consolidation.	Amount of capital stock.
New York, Pennsylvania & Ohio Railroad Co. of Pennsylvania	New York, Pennsylvania and Ohio Railroad Co	New York, Pennsylvania and Ohio Railroad Co	1880. March 24	.....
New York, Pennsylvania & Ohio Railroad Co. of Ohio	Toledo, Delphos & Burlington Railroad Co	Toledo, Delphos and Burlington R. R. Co	June 21	.....
Toledo, Delphos & Burlington Railroad Co	Dayton, Covington & Toledo Railroad Co	Toledo, Ann Arbor and Grand Trunk R'y Co.	October 15	.....
Dayton, Covington & Toledo Railroad Co	Toledo & Ann Arbor Railroad Co. of Michigan and Ohio.	Butler and Detroit Railroad Co	22	.....
Toledo & Ann Arbor Railroad Co. of Michigan	Toledo, Ann Arbor & Northwestern Railroad Co. of Michigan	The Connotton Valley R'y Co.	November 29	\$3,000,000
Northwestern Ohio Railroad Co	Butler & Detroit Railroad Co	The New York, Ft. Wayne and Chicago R. R. Co.	December 7	7,400,000
The Connotton Valley Railway Co. and the Connotton Northern Railway Co.	The Ohio Railway Co. and Ohio, Ft. Wayne and Chicago Railroad Co.	The Toledo, Delphos and Burlington Railroad Co	March 18, 1881	5,000,000
The Ohio Railway Co. and Ohio, Ft. Wayne and Chicago Railroad Co.	The Tol., Delphos & Burl'ton R. R. Co. and the Dayton & Southeastern R. R. Co	The Ohio, Indiana and Pacific R'y Co	22	10,000,000
The Tol., Delphos & Burl'ton R. R. Co. and the Dayton & Southeastern R. R. Co	The Ohio & Indiana State Line R'y Co. and The Indiap'lis & Ohio S. L. R'y Co	The Indiana, Bloomington and Western Railway Co.	24	.....
The Ohio & Indiana State Line R'y Co. and The Indiap'lis & Ohio S. L. R'y Co	The Indiana, Bloom'ton & West'n R'y Co. and The Ohio, Ind'a & Pacific R'y Co	The New York, Chicago and St. Louis R'y Co.	April 13	35,000,000
The Buffalo, Cleveland and Chicago Railway Co. of New York	The Buffalo, Cleveland and Chicago Railway Co. of Pennsylvania	The Detroit, Butler and St. Louis R. R. Co.	May 25	.....
The Buffalo, Cleveland and Chicago Railway Co. of New York	The New York and Chicago Railway Co. of Ohio	The Pittsburgh, Youngstown and Chicago R'y Co.	July 1	4,000,000
The New York and Chicago Railway Co. of Ohio	The New York and Chicago Railway Co. of Indiana	The New York, Pittsburgh and Chicago R'y Co.	18	7,000,000
The New York and Chicago Railway Co. of Indiana	The Detroit, Butler and St. Louis R. R. Co. and Butler and Detroit R. R. Co.	The Evansville, Dayton and Eastern Railroad Co.	30	6,500,000
The Detroit, Butler and St. Louis R. R. Co. and Butler and Detroit R. R. Co.	The Pittsburgh, Youngstown and Chicago Railroad Co. of Ohio	The Columbus, Hocking Valley and Toledo R'y Co	Aug. 20	20,000,000
The Pittsburgh, Youngstown and Chicago Railroad Co. of Ohio	The Pittsburgh, Youngstown and Chicago Railroad Co. of Pennsylvania	The Evansville, Seymour and Bellefontaine R'y Co.	30	6,000,000
The New York, Pittsburgh and Chicago Railway Co. of Ohio	The New York, Pittsburgh and Chicago Railway Co. of Ohio	The Sharpville and Lake Shore Railroad Co.	30	.....
The New York, Pittsburgh and Chicago Railway Co. of Ohio	The Pittsburgh and Chicago Railway Co.	The Ohio Railway Co.	Sept. 7	20,000,000
The Pittsburgh and Chicago Railway Co.	The Dayton, Evansville and Southwestern Railway Co.	The Wabash, St. Louis and Pacific Railway Co.	12	.....
The Dayton, Evansville and Southwestern Railway Co.	The Evansville, Dayton and Eastern Railroad Co	The Pittsburgh and Western Railroad Co.	28	120,000
The Evansville, Dayton and Eastern Railroad Co	The Ohio and West Virginia Railway Co.	The Baltimore, Cincinnati and Western Railway Co	Oct. 1	18,000,000
The Ohio and West Virginia Railway Co.	The Columbus and Hocking Valley Railroad Co	The Toledo, Delphos and Burlington Railroad Co	25	8,000,000
The Columbus and Hocking Valley Railroad Co	The Evansville, Sey. & Bellefo'e R. R. Co. & The Bellefo'e, Troy & Ind'a R. R. Co.			
The Evansville, Sey. & Bellefo'e R. R. Co. & The Bellefo'e, Troy & Ind'a R. R. Co.	The Lake Shore and Lake Shore Railroad Co			
The Lake Shore and Lake Shore Railroad Co	The Cleveland, Columbus, Cincinnati and Indianapolis Railway Co.			
The Cleveland, Columbus, Cincinnati and Indianapolis Railway Co.	The Cincinnati, Hamilton and Dayton Railroad Co.			
The Cincinnati, Hamilton and Dayton Railroad Co.	The Detroit, Butler and St. Louis Railroad Co			
The Detroit, Butler and St. Louis Railroad Co	The Wabash, St. Louis and Pacific Railway Co.			
The Wabash, St. Louis and Pacific Railway Co.	The Pittsburgh and Western Railroad Co.			
The Pittsburgh and Western Railroad Co.	The Youngstown and State Line Railroad Co			
The Youngstown and State Line Railroad Co	The Baltimore, Cincinnati and Western Railway Co. of Maryland			
The Baltimore, Cincinnati and Western Railway Co. of Maryland	The Baltimore, Cincinnati and Western Railway Co. of Virginia			
The Baltimore, Cincinnati and Western Railway Co. of Virginia	The Baltimore, Cincinnati and Western Railway Co. of West Virginia			
The Baltimore, Cincinnati and Western Railway Co. of West Virginia	The Toledo, Delphos and Burlington Railroad Co. of Ohio.			
The Toledo, Delphos and Burlington Railroad Co. of Ohio.	The Iron Railroad Company			

TABLE XXXVII.—RAILROAD COMPANIES WHOSE NAMES HAVE BEEN CHANGED, FROM JANUARY 1, 1880, TO NOVEMBER 15, 1881.

Old name of company.	Change of name to—	Date of filing certificate.
The Cincinnati and Fayetteville Railroad Company.....	The Cin., Fayetteville, Hillsboro and Huntington R'y Co.....	1880. April 6
The Springfield, St. Paris and Sidney Railroad Company.....	The Springfield Northern Railway Company .....	September 20 1881.
The Columbus and Maysville Railway Co.—Southern Div....	The Columbus and Maysville Railway Co.....	February 9
The Cin., Fayetteville, Hillsboro and Huntington R'y Co....	The Cincinnati, Hocking Valley and Huntington R'y Co....	March 15
The Island Creek and Richmond Mineral Railroad Co.....	The Steubenville, Canton and Cleveland Railway Co.....	" 26
The Springfield Southern Railroad Co.....	The Ohio Southern Railroad Co.....	May 23
The Cleveland, Canton, Coshocton and Straitsville R'y Co...	The Connotton Valley and Straitsville R. R. Co.....	June 20
The Miami Valley and Columbus Railroad Company.....	The Columbus and Cincinnati Railway Co.....	September 19



## TABLE XXXVIII.—MISCELLANEOUS CERTIFICATES.

*(From Report of Secretary of State for 1881.)*

## CHANGE OF LINE.

*April 26, 1881*—The Columbus and Maysville Railroad Co.: To run from Columbus, in Franklin county, southward through the counties of Franklin, Pickaway, Madison, Fayette, Highland and Brown, in Ohio, to Aberdeen, on the Ohio river, passing through the towns of Washington C. H., Hillsboro and Ripley, to a line designated and set forth in the said certificate.

*June 18, 1881*—The Springfield Northern Railway Co.: That the line of the road of said company has not been finally located; that, by mistake, the county of Miami, in the State of Ohio, was omitted as one of the counties through which said road shall pass. The said road shall pass through Miami county, to properly locate and construct the road.

*July 15, 1881*—The New York, Chicago and St. Louis Railway Co.: That it is necessary to pass through the counties of Sandusky and Erie, in the State of Ohio, for the purpose of avoiding dangerous and difficult curves and grades.

*July 25, 1881*—The Northwestern Ohio Railroad, now the Detroit, Butler and St. Louis Railroad: Changing the line through Williams county.

*Sept. 6, 1881*—The Chicago and Atlantic Railway Co.: Changing the line so as to run through the county of Van Wert, instead of the county of Mercer, in the State of Ohio.

*Sept. 6, 1881*—The Chicago and Atlantic Railway Co.: Changing the line from Marion to Kenton, Ohio.

*Sept. 21, 1881*—The Chicago and Atlantic Railway Co.: Changing the line from Kenton, Ohio, through the counties of Hardin, Allen and Van Wert, in said State.

*Oct. 19, 1881*—The Cleveland, Delphos and St. Louis Railroad Co.: Changing line to pass through the counties of Wyandot, Crawford, Richland and Lorain.

## LOCATION OF LINE AND TERMINI.

*Jan. 3, 1881*—The Ohio Railway Co.: Line changed to pass through the counties of Lorain, Medina, Summit, Portage and Trumbull, in the State of Ohio, beside the counties of Paulding, Putnam, Hancock, Seneca and Huron, named in the original articles of incorporation of this company.

*April 14, 1881*—The Western Reserve Railroad Co.: Changing eastern terminus, and extending line from Tiffin, Seneca county, through the counties of Seneca, Huron, Lorain, Medina, Summit, Portage, Geauga and Trumbull, to the State line of Pennsylvania

*June 20, 1881*—The Cleveland, Canton, Coshocton and Straitsville Railway Co.: Extending the line southward from the present southern terminus of the line at Coshocton, through the counties of Coshocton, Muskingum, Perry and Athens, to the village of Athens.

*Aug. 24, 1881*—The New York, Chicago and St. Louis Railway Co.: Fixing the line and termini through the counties of Ashtabula and Paulding, being the east and west boundaries of the State of Ohio, through which said road passes.

#### EXTENSION OF LINE, AND CHANGE OF TERMINI.

*March 26, 1881*—The Island Creek and Richmond Mineral Railroad: From Richmond to Canton, Ohio.

*Sept. 19, 1881*—The Cleveland, Ellico and Southern Railroad Co.: Changing or extending southern terminus from Ellico, Wayne county, to Pomeroy, Meigs county, Ohio.

#### CHANGE OF TERMINI.

*April 25, 1881*—The Spring Grove, Avondale and Cincinnati Railway Co.: Changed from Venice, in Butler county, to Spring Grove Cemetery, in Hamilton county.

*Nov. 7, 1881*—The Bellaire and Southwestern Railway Co.: Extending line from Athens to Cincinnati, Ohio, passing through the counties of Muskingum, Perry, Fairfield, Hocking, Ross, Highland, Pike, Adams, Brown, Clermont and Hamilton.

#### CHANGE OF LOCATION OF PRINCIPAL OFFICE.

*Oct. 24, 1881*—The New York, Pittsburgh and Chicago Railway Co.: Locating principal office at New Lisbon, Ohio.

#### EXTENSION OF OPERATIONS.

*May 26, 1881*—The Steubenville, Canton and Cleveland Railway Co.: Certificate to borrow money by issuing preferred stock:

First mortgage bonds issued.....	\$1,080,000
Second " " " .....	720,000

TABLE XXXIX.—SHOWING THE AMOUNT AND ANNUAL INCREASE OF STOCK, DEBTS, ETC., OF RAILWAYS IN OHIO FOR THIRTEEN YEARS, EACH YEAR ENDING JUNE 30.

Entire lines.	1868.	1869.	1870.	1871.
Capital stock paid in .....	\$171,960,942 38	\$176,087,825 26	\$196,893,555 70	\$210,387,148 87
Funded debt .....	133,111,293 88	155,119,115 82	155,633,627 09	171,011,069 57
Floating debt .....	8,494,465 73	31,766,695 98	5,590,823 46	6,541,632 33
Length of main lines and branches, (miles) .....	5,891	5,992	6,283	6,536
Cost of road and equipment .....	\$302,569,874 04	\$321,666,115 45	\$333,496,116 86	\$365,778,316 25
Gross earnings .....	47,118,732 44	51,110,529 13	52,895,812 59	59,151,418 82
Operating expenses .....	32,920,034 32	35,731,316 32	37,020,331 69	40,296,667 38
Net earnings .....	14,198,688 12	15,379,212 81	15,875,480 90	18,854,751 44
Passengers carried (number) .....	9,436,416	10,361,078	11,833,657	12,000,000
Received for Passengers carried .....	\$14,861,784 44	\$15,611,298 05	\$16,802,719 05	\$16,333,218 82
Freight transported (tons) .....	10,813,535	14,559,704	14,864,598	17,263,823
Received for freight transported .....	\$29,001,212 50	\$32,596,299 50	\$33,348,195 20	\$39,296,617 11
Interest paid on bonds, including taxes .....		4,679,156 64	6,291,317 53	7,505,432 81
Dividends paid .....	3,801,290 67	5,647,645 93	7,002,873 61	7,278,051 84
Persons employed in operating road .....				
<i>Proportion for Ohio.</i>				
Of capital stock paid in .....	\$103,346,607 42	\$106,686,116 52	\$114,734,817 36	\$115,432,037 91
Funded debt .....	75,206,330 37	88,037,702 28	84,137,619 38	92,313,475 00
Floating debt .....	4,790,212 10	18,040,582 40	3,041,030 72	3,531,506 30
Total debt .....	79,996,548 47	106,078,284 68	87,178,640 10	95,844,981 30
Length of main line and branches with rail (miles) .....	3,236	8,324	8,376	8,457
Length of sidings, etc. .....	683	741	788	845
Cost of road and equipment .....	\$167,036,614 51	\$176,455,722 84	\$176,142,081 01	\$188,152,405 56
Animals killed (number) .....	2,402	2,149	1,563	2,348
Amount paid for same .....	\$12,211 92	\$42,676 83	\$28,146 57	\$55,490 03
Total earnings .....	28,788,827 28	30,136,663 27	27,909,308 39	30,384,518 27
Operating expenses .....	20,675,118 43	21,091,591 25	19,422,377 93	20,776,222 57
Net earnings .....	8,113,708 85	9,045,072 02	8,486,930 46	9,608,295 70
Persons employed in operating road .....	19,884	21,732	21,895	21,193

TABLE XXXIX.—SHOWING THE AMOUNT AND ANNUAL INCREASE OF STOCK, DEBTS, ETC.—Continued.

Entire line.	1872.			1873.			1874.		
Capital stock paid in.....	\$219,161,127	55		\$247,099,912	75		\$264,357,620	48	
Funded debt.....	217,171,755	12		238,148,362	04		257,825,315	55	
Floating debt.....	10,738,179	72		15,483,814	38		19,872,681	92	
Length of main lines and branches.....	7,408			7,573			7,809		
Cost of road and equipment.....	\$388,113,494	48		\$462,094,996	87		\$484,268,484	79	
Gross earnings.....	65,603,078	12		74,917,263	40		70,328,194	67	
Operating expenses.....	45,034,708	21		53,885,608	22		51,130,025	30	
Net earnings.....	20,568,369	91		21,031,655	18		19,798,169	37	
Passengers carried (number).....	12,068,832			13,885,688			15,487,294		
Received for passengers carried.....	\$16,103,461	81		\$17,191,911	70		\$17,222,304	30	
Freight transported (tons).....	20,983,068			26,589,562			26,199,435		
Received for freight transported.....	\$45,889,178	26		\$53,586,343	12		\$49,608,576	52	
Interest paid on bonds, including taxes.....	9,726,359	06		12,399,659	34		12,630,377	83	
Dividends paid.....	7,554,032	09		8,965,333	26		6,512,218	21	
Persons employed in operating road.....	.....			57,406			50,872		
<i>Proportion for Ohio.</i>									
Of capital stock paid in.....	\$122,721,526	87		\$138,931,618	34		\$150,547,397	17	
Funded debt.....	120,222,072	00		130,585,217	48		136,836,554	57	
Floating debt.....	5,945,700	98		9,663,228	30		15,596,810	e3	
Total debt.....	126,167,772	98		140,248,445	78		152,433,365	83	
Length of main line and branches laid with rail (miles).....	3,787			4,163			4,374		
Length of sidings, etc (miles).....	890			1,044			1,141		
Cost of road and equipment.....	\$206,352,805	71		\$258,400,155	25		\$272,937,812	29	
Animals killed (number).....	1,926			2,184			2,803		
Amount paid for same.....	\$45,572	46		\$33,364	78		\$57,547	15	
Total earnings.....	34,257,799	67		38,175,332	39		37,177,129	74	
Operating expenses.....	23,502,739	38		27,301,884	17		27,063,273	85	
Net earnings.....	10,755,060	29		10,873,448	22		10,113,855	98	
Persons employed in operating road.....	25,393			29,433			27,711		

TABLE XXXIX.—SHOWING THE AMOUNT AND ANNUAL INCREASE OF STOCK, DEBTS, ETC.—Continued.

Entire lines.	1875.			1876.			1877.		
Capital stock paid in.....	\$268,507,543	68		\$270,842,187	93		\$275,909,790	45	
Funded debt.....	269,470,632	92		274,208,045	50		282,495,121	32	
Floating debt.....	32,101,384	31		29,282,173	93		25,533,517	66	
Length of main lines and branches.....	8,219			8,002			8,293		
Cost of road and equipment.....	\$496,224,906	76		\$505,937,839	46		\$510,073,423	73	
Gross earnings.....	64,495,325	83		63,261,140	63		58,134,879	96	
Operating expenses.....	46,979,638	89		45,381,702	32		43,360,627	80	
Net earnings.....	17,515,686	94		17,879,438	31		14,774,252	16	
Passengers carried (number).....	17,193,948			18,175,963			17,297,852		
Received for passengers carried.....	\$17,116,324	48		\$16,486,867	77		\$15,628,866	83	
Freight transported (tons).....	25,750,501			29,338,799			30,339,704		
Received for freight transported.....	\$42,230,930	11		\$42,444,092	47		\$38,681,087	23	
Interest paid on bonds, including taxes.....	12,691,903	72		9,819,202	01		9,832,989	83	
Dividends paid.....	6,377,791	09		6,236,572	63		4,520,417	80	
Persons employed in operating road.....	48,216			51,379			49,600		
<i>Proportion for Ohio.</i>									
Of capital stock paid in.....	\$152,714,519	27		\$154,925,694	73		\$158,868,283	22	
Funded debt.....	144,514,285	60		147,452,402	24		152,620,432	72	
Floating debt.....	16,732,260	64		18,941,847	82		18,226,469	06	
Total debt.....	161,247,086	24		166,394,250	06		170,846,901	78	
Length of main line and branches laid with rail (miles).....	4,461			4,459			4,719		
Length of sidings, etc. (miles).....	1,190			1,302			1,249		
Cost of road and equipment.....	\$278,314,012	48		\$283,090,404	39		\$288,459,168	47	
Animals killed (number).....	2,027			1,659			1,226		
Amount paid for same.....	\$35,668	68		\$36,356	91		\$24,092	32	
Total earnings.....	35,254,117	60		34,119,049	16		31,057,026	66	
Operating expenses.....	25,573,058	14		24,404,565	31		22,977,796	74	
Net earnings.....	9,681,059	46		9,714,483	85		8,079,229	02	
Persons employed in operating road.....	27,716			26,433			26,502		

TABLE XXXIX.—SHOWING THE AMOUNT AND ANNUAL INCREASE OF STOCK, DEBTS, ETC.—Continued.

Entire lines.	1878.	1879.*	1880.	1881.
Capital stock paid in .....	\$275,517,493 72	\$275,072,278 44	\$334,909,089 04	\$347,709,785 49
Funded debt.....	284,489,425 82	152,534,473 04	333,860,901 25	380,063,084 41
Floating debt .....	23,182,650 62	9,427,458 61	24,495,519 39	24,464,914 28
Length of main lines and branches (miles).....	8,553	8,553	10,931	12,054,63
Cost of road and equipment .....	\$509,828,562 84	\$509,407,151 55	\$619,891,600 32	\$696,194,896 07
Gross earnings .....	59,889,645 77	57,288,363 16	82,427,858 20	96,213,853 41
Operating expenses.....	40,333,948 18	38,251,123 77	49,044,889 41	61,313,043 71
Net earnings.....	19,730,461 20	18,957,204 51	32,759,650 75	34,655,239 36
Passengers carried (number).....	16,626,151	15,040,873	20,475,093	22,830,441
Received for passengers carried.....	\$14,636,435 76	13,450,879 46	\$18,224,420 00	\$20,891,079 13
Freight transported (tons).....	31,909,172	33,487,248	48,511,187	55,279,369
Received for freight transported .....	\$41,218,493 18	\$40,039,506 66	\$59,574,349 81	\$69,507,360 91
Interest paid on bonds, including taxes.....	9,535,536 92	7,524,946 33	13,586,858 29	13,766,959 53
Dividends paid .....	5,277,467 29	6,402,948 33	8,417,793 42	9,068,184 52
Persons employed in operating road.....	47,294	41,260	62,171	75,512
<i>Proportion for Ohio.</i>				
Of capital stock paid in.....	\$158,419,408 78	\$158,595,316 61	\$177,418,825 53	\$185,926,026 17
Funded debt .....	158,312,883 88	77,426,379 99	176,428,426 34	184,442,691 04
Floating debt .....	12,900,694 86	4,785,370 60	12,944,630 60	11,859,819 44
Total debt .....	171,213,578 74	82,211,750 59	189,373,056 94	196,302,510 48
Length of main line and branches laid with rail (miles)....	4,785	4,771	5,654 82	5,835 49
Length of sidings, etc. (miles).....	1,273	1,285	1,455 14	1,185 98
Cost of road and equipment .....	\$280,779,414 71	\$260,236,685 33	\$312,459,197 30	\$343,091,394 64
Animals killed (number).....	1,316	939	1,823	1,899
Amount paid for same .....	\$25,836 49	\$14,127 47	\$21,765 13	\$27,009 19
Total earnings .....	32,226,634 46	27,436,914 77	41,329,300 48	45,822,984 64
Operating expenses .....	21,718,648 15	18,246,873 23	24,698,767 60	29,301,700 05
Net earnings.....	10,525,589 92	9,258,824 10	15,792,740 08	16,756,107 23
Persons employed in operating road.....	25,146	22,909	29,498	34,460

\* These totals are incomplete, owing to failure of certain companies to report in 1879.



TABLE XL.—CHARACTERISTICS AND COST OF CONSTRUCTION OF TELEGRAPH LINES.

Number.	Name.	Length of line— Miles.		Number of employees.		Number of stations.		Cost of line, equip- ment, etc.
		Entire line.	In Ohio.	Entire line.	In Ohio.	Entire line.	In Ohio.	
1	Atlantic and Pacific (sold to W. U. January 1, 1881)	(b)	(b)	(b)	(b)	(b)	(b)	(a)
2	American District of Cincinnati	16.	16.	69	69	1	1	\$16,218 50
3	American Union (sold to W. U. January 1, 1881)	(b)	(b)	(b)	(b)	(b)	(b)	(a)
4	Cincinnati and Eastern	70.19	70.19	11	11	11	11	5,000 00
5	City and Suburban of Cincinnati	204.00	204.00	100	100	.....	.....	195,805 20
6	Connotton Valley	60.20	60.20	10	10	10	10	3,341 95
7	Kingsville Magnetic	1.55	1.55	1	1	2	2	150 00
8	McConnellsville and Zanesville	28.00	28.00	(b)	(b)	3	3	(b)
9	Put-in-Bay	23.00	23.00	(b)	(b)	2	2	(b)
10	Tri-Union	21.00	21.00	7	7	7	7	1,425 00
11	Union Metropolitan of Cleveland	7.00	7.00	12	12	7	7	1,845 68
12	Western Union	(a)	(b)	(b)	(b)	(b)	(b)	(a)
Total		430.94	430.94	210	210	43	43	\$223,786 33

(a) Unknown.

(b) Not reported.

TABLE XII.—CAPITAL STOCK AND DEBT OF TELEGRAPH COMPANIES.

Number.	Name.	Capital stock.			Debt.			Ohio stock-holders.	
		Amount authorized.	Amount subscribed.	Amount paid in.	Funded.	Other.	Total.	Number.	Amount of stock held by them.
1	Atlantic and Pacific .....	\$15,000,000	(a)	(a)	None.	None.	.....	(a)	(a)
2	American District of Cincinnati.....	75,000	\$75,000	\$75,000	(b)	(b)	.....	9	\$56,000
3	American Union .....	10,000,000	(a)	(a)	None.	None.	.....	(a)	(a)
4	Cincinnati and Eastern .....	10,000	5,000	5,000	(b)	(b)	.....	8	5,000
5	City and Suburban of Cincinnati.....	100,000	100,000	100,000	.....	\$53,000	\$53,000	(b)	(b)
6	Connotton Valley .....	(c)	.....	.....	.....	.....	.....	.....	.....
7	Kingsville Magnetic .....	150	150	150	.....	.....	.....	30	150
8	McConnellsville and Zanesville.....	(c)	.....	.....	.....	.....	.....	.....	.....
9	Put-in-Bay .....	10,000	6,650	6,650	.....	.....	.....	17	6,650
10	Tri-Union .....	1,000	.....	.....	.....	200	200	13	3,825
11	Union Metropolitan of Cleveland..	5,000	350	350	.....	.....	.....	3	300
12	Western Union .....	80,000,000	(a)	(a)	\$6,244,102	None.	6,244,102	(a)	(a)
	Total .....	\$105,201,150	\$187,150	\$187,150	\$6,244,102	\$53,200	\$6,297,302	80	\$71,925

(a) Unknown.

(b) None reported.

(c) Owned by private individual.

TABLE XLII.—EARNINGS, EXPENSES, ETC., OF TELEGRAPH COMPANIES.

Number.	Name.	Earnings and operating expenses.			Dividends.		Interest on bonds paid—Amount.	Other payments.	Receipts other than earnings.
		Gross earnings.	Operating expenses.	Net earnings.	Rate per cent.	Amount.			
1	Atlantic and Pacific.....	(a)	(a)	(a)	6	(a)	(a)	(a)	(a)
2	American District of Cincinnati.....	\$20,153 71	\$16,433 57	\$3,720 14					
3	American Union.....	(a)	(a)	(a)	3½	(a)	(a)	(a)	(a)
4	Cincinnati and Eastern.....	1,537 40	350 47	1,186 93	6 and 15	\$495 00		\$314 37	\$500 00
5	City and Suburban of Cincinnati.....	125,834 04	99,263 96	26,070 08					
6	Connotton Valley.....	603 88							
7	Kingsville Magnetic.....	68 37	21 69	46 68	19½	29 00			
8	McConnellsville and Zanesville.....	(a)							
9	Put-in-Bay.....	568 98	18 80	550 18					
10	Tri-Union.....	175 00	52 62	122 38					
11	Union Metropolitan of Cleveland.....	1,353 41	1,345 68	7 73					
12	Western Union.....	(b)	(b)	(b)	6		\$427,455 51	467,460 86	4,767 92
	Total.....	\$149,764 79	\$117,476 39	31,704 12		\$524 00	\$427,455 51	\$467,775 23	5,267 92

(a) None reported.

(b) Unknown.

SALES AND CONSOLIDATIONS OF TELEGRAPH COMPANIES.

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January, 1881. W. U. Telegraph Co. purchased all the property, lines, leases, contracts and franchises of the American Union Telegraph Co., and also of the Atlantic and Pacific Telegraph Co.

Tri-Union Telegraph Co. bought the line of, or consolidated with, the Ohio Telegraph and Telephone Co. Also bought the Chagrin Falls and Solon Telegraph and Telephone line. Date not given.

REPORTS OF RAILROAD COMPANIES.

## ALLIANCE AND LAKE ERIE RAILROAD COMPANY.

Name of road: Alliance and Lake Erie Railroad.

By whom owned: Alliance and Lake Erie Railroad Company.

By whom operated: Alliance and Lake Erie Railroad Company.

By what authority: Charter and stock ownership.

Name of company making this report: Alliance and Lake Erie Railroad Company:

General office in Ohio, at New York, State of New York.

Principal office at Alliance, Stark county, Ohio.

Address correspondence relating to this report to W. E. Lewis, Gen. Supt., at Alliance, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

History given in previous report.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
H. W. Ford .....	President, New York.....	New York City.....	None.
W. R. Bergholz.....	Vice President, New York	" .....	"
E. H. Pullen .....	Secretary, New York.....	" .....	"
T. T. Buckley .....	Treasurer, " .....	" .....	"
W. E. Lewis .....	General Supt., Alliance.....	Alliance, Ohio.....	\$3,000 00
W. R. Bergholz.....	Chief Engineer, New York	New York.....	None.
H. W. Ford.....	} Executive Committee {	New York City.....	.....
W. R. Bergholz.....		" .....	.....
T. T. Buckley.....		" .....	.....
Total salaries.....			\$3,000 00

### DIRECTORS.

Name.	Residence.	Name.	Residence.
H. W. Ford.....	New York...	L. L. Lamborn .....	Ohio.
T. T. Buckley .....	" ..	A. W. Coates .....	"
W. R. Bergholz.....	" ..	F. Barber .....	"
E. H. Pullen.....	" ..	A. Wright .....	"
		W. A. Lynch.....	"



## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$450,000 09
Number of shares, 9,000.	
Par value of each—common .....	\$50

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$450,000 00
Amount subscribed—common .....	300,000 00
Total paid in capital stock—common.....	100,000 00
Average amount paid in per mile of single main track, (25 miles) \$4,000 00	
Proportion of same for Ohio, (25 miles) .....	100,000 00

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.
For subscriptions paid in cash .....	6,000	.....
Total .....	6,000	\$300,000 00

Stockholders, residents of Ohio, 5.

Amount of stock held by them June 30, 1881 ..... \$250 00

Agents authorized to transfer stock: E. H. Pullen, New York City.

Number of shares transferred within the year at such agencies, 6,000.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....	By mortgage.....	1880	1910	7%	\$150,000 00	\$150,000 00
Total .....					\$150,000 00	\$150,000 00

Average amount per mile of single main track, (25 miles) ..... \$6,000 00

Proportion of same for Ohio, (25 miles) ..... 150,000 00

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expendi- tures to July 1, 1881.
Right of way.....	\$5,142 45		\$5,142 45
Civil engineering.....	244 40	\$2,442 99	2,687 39
Grading and masonry .....	1,874 73		1,874 73
Bridges .....	3,881 01		3,881 01
Timber and ties .....			
Superstructure .....			
Iron rails, chairs and spikes.....			
Fencing.....	30 38		30 38
Passenger and freight stations.....		100 00	100 00
Engine and car houses.....		200 00	200 00
Other buildings and fixtures .....	747 39	50 00	797 39
Steel rails.....		1,850 39	1,850 39
Total expenditures for construction	\$11,920 36	\$4,643 38	\$16,563 74

## COST OF EQUIPMENT OWNED BY COMPANY.

2 locomotives.....	\$13,000 00
1 first-class passenger car.. ..	2,500 00
1 box freight car.....	325 00
54 platform cars.....	10,000 00
1 baggage car.....	1,000 00
3 section cars .....	75 00
3 hand cars.....	150 00
1 caboose car.....	500 00

Total cost of railroad equipment owned by company .....	\$27,550 00
Average amount per mile (of single main track 25 miles) .....	\$1,102 00

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Alliance to Waynesburg—miles .....	22
From Phalanx to Southington “ .....	6
Proposed gauge, 36 inches.	

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Alliance to Phalanx.....	25 miles.	25 miles.
Aggregate of sidings and other tracks .....	1 mile.	1 mile.

Total length laid with rail computed as single track.....	26 miles.	26 miles.
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Stark .....	1.42	.35	1.77
Mahoning.....	4.52	.....	4.52
Portage .....	11.59	.33	11.92
Trumbull .....	7.47	.32	7.79
Totals .....	25.	1.	26.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	3 feet.
Grade—Maximum, per mile .....	83 "
Longest maximum.....	500 "
Aggregate length of maximum .....	500 "
Curvature—Shortest radius .....	359 "
Aggregate length of shortest radius .....	976 "
Aggregate length of all radii.....	16,268 "
Aggregate length of tangent.....	21,75 miles.
Rail—Iron—On road.....	26 "
Average weight per yard.....	30 lbs.
Steel—On road .....	$\frac{1}{2}$ mile.
Average weight per yard.....	30 lbs.
Ties—Average number per mile.....	2,600
Number laid during the year.....	1,000
Ballasted—On whole line .....	2 miles.
In Ohio—coal slate .....	2 "

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	2 ; greatest age.....	7 years ; aggregate length, ft..	224
Total.....			224
Trestles—10 ; greatest age, 7 years ; greatest height, 32 ft. ; greatest length, 689 ft. ; aggregate length, 2,886 ft.			
Length of shortest span of truss, 24 ft. ; of longest, 24 ft. ; greatest length of beams between points of support, if not trussed, 16 ft.			
Greatest space between cross ties upon bridges and trestles, 18 inches ; length of ties, 7 ft.			
Number of track stringers, 2.			
Are all bridges and trestles provided with guard rails? No.			
Do all bridges and trestles receive stated examinations? Yes.			
How often? Monthly.			
Are the examinations analytical, and are they made by a competent person? By a competent person.			

Fencing—Average and Aggregate Cost.	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	7	7

Kind of fencing, as follows:

Post and board (average cost per rod, 90 cents.)

Length of road unfenced, 22½ miles.

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality? N. Y.,

P. & O. road, at Braceville.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS.

Passenger and freight [number]—15; in Ohio, 15.

#### ROLLING STOCK.

Locomotives.....	[No.] 2;	Average weight, lbs.....	37,000
Express and baggage cars .....	1;	" " .....	20,000
Passenger cars.....	1;	" " .....	20,000
Freight cars .....	57;	" " .....	17,000

Above includes not owned by company reporting.

Freight cars..... 3; Owned by W. B. Wilson.

Terms of service: 1 cent. per mile wheelage.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: By stoves.

Means of lighting same: Oil lamps.

#### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	14 miles per hour.
Mail and accommodation, .....	12 "
Freight trains, .....	12 "

#### EMPLOYES.

Superintendents.....	1
Engineers.....	2
Baggagemen.....	1
Flagmen, switch-tenders and watchmen.....	1
Laborers .....	8
Clerks .....	2
Firemen .....	2
Wipers .....	2
Mechanics .....	1
Conductors.....	2
Brakemen. ....	3
Station agents.....	2
Section men .....	38
Other employees .....	3

Total number employed by company in operating line ..... 68

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles.....	3.2c.	3c.	3.1c.
For distances over 8 miles—1st class.	3.	3c.	3. c.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class.....	.7c	.3c	.5c.
Second class .....	.55c	.26c	.405c.
Third class.....	.45c	.22c	.335c.

Rate per ton per mile on freight carried less than 30 miles :

First class .....	14c	6c	10c.
Second class .....	11c	5c	8 c.
Third class.....	9c	4c	6½c.

Rate per ton per mile for—

Coal—Carried ten miles or more.....	55c	36c	45½c.
Carried less than ten miles.....	50c	36c	43c.
Iron ore—Carried 10 miles or more.....	56c	36c	46c
Carried less than 10 miles.....	56c	36c	46c.
Undressed stone or lumber—Carried 10 miles or more .....	87c	56c	72½c.
Carried less than 10 miles.....	75c	56c	65½c.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Train Mileage—Passenger .....	23,175	
Freight .....	22,650	
Mixed .....	7,725	
Total.....		53,550
Car Mileage—Passenger .....	30,900	
Express and baggage.....	30,900	
Freight—loaded.....	92,914	
empty .....	87,795	
Caboose .....	22,650	
Total .....		265,159
Fuel consumed—Wood, 87 cords ; coal, 850 tons.		
Losses, etc., paid—For injuries in Ohio, fatal and non-fatal: To passengers...	\$100 00	
For animals killed in Ohio :		
3 cattle.....	\$73 00	
14 sheep .....	53 00	
Total .....		\$126 00

EARNINGS.	
Passenger transportation—local .....	\$10,107 54
through.....	917 00
	<hr/>
Total .....	\$11,024 54



Freight transportation—local.....	\$2,895 98	
through .....	20,703 90	
Total .....		\$23,599 88
Mail service.....		778 67
Total earnings of line operated included in this report.....		\$35,403 09

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$6,689 15	
Maintenance of cars .....	932 77	
Motive power .....	5,193 89	
Conducting transportation .....	6,208 94	
General expenses .....	\$2,385 21	
Taxes in Ohio.....	713 75	
		\$3,098 96
Salaries .....	1,589 95	
Other general expenses of operating.....	1,325 11	
Total operating expenses, being 70.72 per cent. of earnings.....		\$25,038 77
Net earnings of 25 miles operated .....		10,364 32
Net income over operating expenses and rents paid.....		10,364 32

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

Month.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
.....	1880.	Can't say....	Tailoress ....	Lady attempted to get upon train while in motion.....	Broken arm.
June ...	1881.	Harry Moore	None .....	Boy, twelve years old, riding on top of car load of lumber. Car was pulled off track in Alliance yard while switching; lumber fell off and on the boy.....	
					Right leg crushed below the knee. Leg amputated and boy died two weeks after injury.

## SUMMARY OF ACCIDENTS.

## PERSONS INJURED—CAUSES.

Passengers—getting on or off engine or train in motion.....	1	
Others—falling or thrown from engine or train.....	1	
Total .....		2

## RECAPITULATION.

Injured—Passengers—misconduct or want of caution.....	1	
Others—stealing rides.....	1	
Total injured.....		2

*State of New York, county of New York, ss.:*

W. R. Bergholz, Vice President of the Alliance and Lake Erie Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed)

W. R. BERGHOLZ, *Vice President.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 23d day of August, A. D., 1881.

[SEAL.]

EDWIN F. COREY,

*Com'r for the State of Ohio in New York.*

# ASHTABULA AND PITTSBURGH RAILWAY COMPANY.

Name of road: Ashtabula and Pittsburgh Railway.

By whom owned: Ashtabula and Pittsburgh Railway Company.

By whom operated: Pennsylvania Company.

By what authority: Lease.

Name of company making report: Ashtabula and Pittsburgh Railway Company.

General office at Pittsburgh, Pa.

Principal office in Ohio at Ashtabula, Ohio.

Address correspondence relating to this report to Frank Semple, at Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. N. Hutchinson.....	President .....	Philadelphia, Pa.....	.....
Frank Semple .....	Secretary .....	Pittsburgh, Pa .....	.....
" .....	Treasurer .....	" .....	.....
A. F. Hubbard .....	Ass't Secretary.....	Ashtabula, O.....	.....
" .....	Ass't Treasurer .....	" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Warren Packard .....	Warren, O.....	F. Harrington .....	Rock Creek, O.
H. B. Perkins .....	" .....	Wm. Mullins .....	Pittsburgh, Pa.
Caleb B. Wick .....	Youngstown, O.	Wm. Thaw.....	"
F. H. Mathews .....	" .....	Wm. P. Shinn .....	"
Henry Hubbard .....	Ashtabula, O.....	Thos. D. Messler .....	"
H. L. Morrison .....	" .....	W. H. Barnes .....	"
Jno. N. Hutchinson .....	Philadelph., Pa.		

## CAPITAL STOCK.

### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$1,000,000 00
preferred.....	700,000 00
Total.....	\$1,700,000 00

Number of shares—common.....	20,000	
preferred.....	14,000	
Total.....		34,000
Par value of each—common .....	\$50 00	
preferred .....	50 00	
Total paid in capital stock—common.....	\$958,491 58	
preferred.....	700,000 00	
Total.....		\$1,658,491 58
Average amount paid in per mile of single main track (62.604 miles)...		\$26,491 78
Proportion of same for Ohio..... (62.604 miles)...		All.

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.	Amount of preferred.
For purchase of lines .....	33,169. <sup>4158</sup> / <sub>1000</sub>	\$958,491.58	\$700,000
Total .....	33,169. <sup>4158</sup> / <sub>1000</sub>	\$958,491.58	\$700,000

Stockholders, residents of Ohio, 358.

Amount of stock held by them June 30, 1881..... \$102,750 00

Agents authorized to transfer stock: Frank Semple, Secretary, Pittsburgh, Pa.

Number of shares transferred within the year at such agencies, 115.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage bonds.....	.....	Nov. 21, 1878	Aug. 1, 1908	6%	\$1,500,000	\$1,500,000
Total .....						\$1,500,000

Average amount per mile of single main track (62.604 miles) \$23,960 13

Proportion of same for Ohio (62.604 miles)..... All.

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$14,923 45	
Cash securities, debit balances, etc., available to payment ...	26,195 75	
	<hr/>	
Excess of assets.....		\$11,272 30
Decrease since June 30, 1880 .....	\$15,205 08	
	<hr/>	
Total of paid in stock and debt .....		\$3,147,219 28
Total average amount per mile .....	\$50,271 85	
Proportion of same for Ohio.....		All.

## COST OF ROAD EQUIPMENT, Etc.

Purchased from Ashtabula, Youngstown and Pittsburgh Railroad Company.

## ROAD ACQUIRED BY PURCHASE.

Stock and bonds less cash.....	\$3,134,340 50	
Subsequent expenditures for construction .....	14,923 45	
	<hr/>	
Total expended for construction and purchase.....		\$3,149,264 04
Average cost per mile of road owned by company (single main track 62.604 miles).....		\$50,304 52
Proportion of same for Ohio (62.604 miles) .....		All.

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

Net income over operating expenses and rents paid .....	\$105,305 08	
Percentage of same to capital stock and debt.....	3.342%	
Per mile of net earnings, \$1,682.08, proportion for Ohio.....		All.

## OTHER PAYMENTS WITHIN THE YEAR.

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net).....	\$90,000 00	
Premiums and commissions for paying coupons .....	100 00	
Floating debt liquidated.....	15,205 08	
	<hr/>	
		\$105,305 08

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock, common .....	\$958,491 58	
Capital stock, preferred .....	700,000 00	
First mortgage bonds .....	1,500,000 00	
Insecured liabilities.....	14,923 45	
Profit and loss .....	2,044 76	
	<hr/>	
		\$3,175,459 79

## ASSETS.

Cost of road.....	\$3,149,264 04
Cash in treasury.....	87 60
Accounts receivable.....	26,108 15
	<hr/> \$3,175,459 79

*State of Pennsylvania, County of Allegheny, ss.:*

Frank SEMPLÉ, Treasurer of the Ashtabula and Pittsburgh Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

FRANK SEMPLÉ, *Treasurer.*

[SEAL OF R. R.]

Subscribed and sworn to before me this 31st day of August, A. D. 1881.

[SEAL.]

ALEX. C. DUNCAN,  
*Notary Public.*

# PENNSYLVANIA COMPANY, OPERATING ASHTABULA AND PITTSBURGH RAILWAY.

By what authority : Lease.

General office at Pittsburgh, Pa.

Address correspondence relating to this report to J. P. Farley, Auditor, at Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS OF THE PENNSYLVANIA COMPANY OPERATING ROAD.

Name.	Office.	Address.	Salary.
G. B. Roberts.....	President.....	Philadelphia, Pa.....	
J. N. McCullough.....	1st Vice President.....	Pittsburgh, Pa.....	
Wm. Thaw.....	2d ".....	".....	
T. D. Messler.....	3d Vice Pres. and Compt..	".....	
S. B. Liggett.....	Secretary.....	".....	
W. H. Barnes.....	Treasurer.....	".....	
J. P. Farley.....	Auditor.....	".....	
D. W. Caldwell.....	General Manager.....	".....	
W. A. Baldwin.....	Manager.....	".....	
J. T. Brooks.....	General Counsel.....	".....	
F. Slataper.....	Chief Engineer.....	".....	
E. A. Ford.....	Gen. Pass'ger & Ticket Agt.	".....	
Wm. Stewart.....	General Freight Agent.....	".....	
J. N. McCullough.....	} Executive Committee {	".....	
Wm Thaw.....		".....	
T. D. Messler.....		".....	
Jno. P. Green.....		Philadelphia, Pa.....	
Wm. H Barnes.....		Pittsburgh, Pa.....	
Total salaries.....			

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Geo. B. Roberts.....	Philadelphia, Pa.....	H. M. Phillips.....	Philadelphia, Pa.....
J. N. McCullough.....	Pittsburgh, Pa.....	J. N. DuBarry.....	".....
Wm. Thaw.....	".....	J. P. Wetherell.....	".....
T. D. Messler.....	".....	A. J. Cassatt.....	".....
H. H. Houston.....	Philadelphia, Pa.....	Jno P. Green.....	".....
Wistar Morris.....	".....	Wm. H. Barnes.....	Pittsburgh, Pa.....
S. M. Felton.....	".....		



## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Ashtabula Harbor to Youngstown, O...	62.604 miles.	62.604 miles.
Total single main track .....	62.604 miles.	62.604 miles.
Aggregate of sidings and other tracks.....	8.837 miles.	8.837 miles.
Total length laid with rail computed as single track...	71.441 miles.	71.441 miles.
Laid with steel rail.....	7.21 miles.	7.21 miles.
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Ashtabula .....	29.063	5.834	34.897
Trumbull .....	29.700	1.771	31.480
Mahoning .....	3.832	1.232	5.064
Totals.....	62.604	8.837	71.441
Steel rail .....	7.21	.....	7.21

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet, 9 inches.
Grade—Maximum, per mile.....	65 feet.
Longest maximum.....	$\frac{3}{4}$ mile.
Aggregate length of maximum.....	$\frac{3}{4}$ "
Curvature—Shortest radius, 8° 18' curve.....	690 feet.
Aggregate length of shortest radius, one curve.....	508 "
Aggregate length of all radii.....	11.89 miles.
Aggregate length of tangent.....	50.71 "
Rail—Iron—On road.....	64.23 "
Average weight per yard.....	56 lbs.
Steel—On road .....	7.21 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile, main track, 2,816; side track.....	2,640
Number laid during the year.....	24,649
Ballasted—On whole line .....	62.604 miles.
In Ohio.....	62.604 "
With furnace cinder and gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....[No.]	5; greatest age..	8 years; aggregate length, ft.	414
Stone arch,	1; " 2 " "	" "	8
Total .....			422

Trestles—28; greatest age, 7 years; greatest height, 2 ft.; greatest length, 175 ft.; aggregate length, 1,708 ft.

Length of shortest span of truss,  $23\frac{1}{2}$  ft.; of longest, 122 ft.; greatest length of beams between points of support, if not trussed, 14 ft.

Greatest space between cross ties upon bridges and trestles, 6 inches; length of ties, 9 feet 6 inches.

Number of track stringers, 6 if wood.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Once a week by bridge foreman, and semi-annually by inspectors.

Are the examinations analytical, and are they made by a competent person? Yes.

Fencing—Average and Aggregate Cost.	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	99.823	99.823
Kind of fencing, as follows:		
Post and board (average cost per rod, 90 cents).....	99.823	99.823
Cost of fencing .....	\$28,748 70	\$28,748 70
Average cost of same per rod, 90 cents.		
Length of road unfenced, and the reason therefor—miles.....	25.385	25.385
Along Mahoning river and through towns.		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Austintown Coal road, at  $1\frac{1}{2}$  miles north of Youngstown, Ohio.

New York, Pennsylvania & Ohio R. R., at 1 mile north of Warren, Ohio.

Lake Shore & M. S. Railway, at Ashtabula, Ohio.

What railroads cross your road either over or under your grade in this State, and where?

Mahoning Division N. Y., P. & O. R. R., at  $1\frac{1}{4}$  miles south of Warren.

Niles & New Lisbon R. R., at Niles.

Painesville & Youngstown R. R., at Warren.

Number of crossings of highways at grade in this State without protection.....	72
“ “ “ “ at which there are gates or flagmen..	None.
“ “ “ over railroad.....	2
“ “ “ under railroad .....	3

Number of highway bridges 18 feet above track ..... 2

Number of highway bridges less than 18 feet above track..... None.

Do all trains stop at R. R. crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated.....	62.604; in Ohio, 62.604
Miles of same owned by railroad company .....	62.604; “ 62.604

## STATIONS.

Passenger and freight—[Number].....	17; in Ohio, 17
Number with telegraph communication .....	14; " 14
Number of same operated by railroad company .....	14; " 14
Is pay received for messages sent over line owned by railroad company?.....	Yes.

## ROLLING STOCK.

Locomotives .....	[No.] 8; Average weight, lbs.....	59,000
Express and baggage cars.....	2; " .....	29,000
Passenger cars .....	3; " .....	41,000
Freight cars.....	300; " .....	19,000

Above includes not owned by company reporting.

Locomotives .....	8; Owned by P., F. W. & C. R'y.
Express and baggage cars.....	2; " "
Passenger cars.....	3; " "
Freight cars.....	300; " Pennsylvania Company.

## Terms of service :

For locomotives, current expenses and 6 per cent. on valuation.

For passenger cars, 2½ cents, and baggage cars, 1½ cents, per mile.

For freight cars, current repairs and 6 per cent. on valuation.

Number of locomotives equipped with train brakes, 3.

Kind of brake: Westinghouse Automatic air brake.

Number of cars equipped with train brakes, 5.

Kind: Westinghouse Automatic air brake.

Method of bridging between passenger cars, when two or more are run in trains:

Janney patent platform and coupler.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Dripps & Spears patent safety stoves.

Means of lighting same: Candles and lard oil.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	20 miles per hour.
Mail and accommodation, .....	20 "
Freight trains, .....	10 "

## EMPLOYES.

Superintendents.....	1
Telegraph operators .....	13
Engineers.....	10
Baggagemen .....	5
Flagmen, switch-tenders and watchmen .....	3
Laborers .....	127
Clerks .....	8
Train dispatchers.....	2

Firemen .....	10
Wipers.....	2
Mechanics .....	13
Conductors.....	8
Brakemen.....	28
Station agents.....	15
Section men.....	15
Other employes .....	9

Total number employed by company in operating line..... 269  
Proportion for Ohio..... 269

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union Express.

Terms: 40 per cent. of gross receipts from general merchandise and money business.

70 per cent. of gross receipts from oyster business.

Special freight and transportation lines: None; except Union line, owned by Pennsylvania Company.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives.....	{ Passenger.....	16	Joint fastenings .....		12
	{ Freight.....	15	Frogs.....		1
Cars .....	{ Passenger.....	12	Ties—Oak .....		6
	{ Baggage.....	12	Bridges.....	{ Wooden.....	9
	{ Box .....	10		{ Iron.....	24
	{ Stock .....	10		{ Trestles .....	6
	{ Coal.....	8		{ Piling.....	6
Rails .....	{ Flat.....	8	Telegraph poles—Cedar .....		12
	{ Iron.....	5	Fence posts.....		8
	{ Steel .....	9			

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—	Highest.	Lowest.	Average.
For distances less than 8 miles .....	4 Cts.	3 Cts.	3½ Cts.
For distances over 8 miles—1st class.....	3	2	2½
2d class.....	2	1	1½
Emigrant.....	2	1	1½
Excursion .....	2	1	1½

\* Minimum rate 10 cents.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

	Highest.	Lowest.	Average.
First class.....	.024 Cts.	00 246 Cts.	.0061 Cts.
Second class.....	.024	00 230	
Third class.....	.024	00 200	
Fourth class.....	.020	00 185	
Fifth class.....	.016	00 154	

Rate per mile on freight carried less than 30 miles:

First class.....	48	0517	01.223
Second class.....	48	0517	
Third class.....	48	0483	
Fourth class.....	40	0448	
Fifth class.....	32	0414	

Rate per ton per mile on freight carried more than 30 miles:

First class.....	.05	.0492	01.223
Second class.....	.05	.0461	
Third class.....	.0467	.0400	
Fourth class.....	.0433	.0369	
Fifth class.....	.0366	.0308	

Rate per ton per mile for—

Coal—Carried 10 miles or more.....	05	0246	01.223
Carried less than 10 miles.....	18	0555	
Pig iron—Carried 10 miles or more.....	05	0318	
Carried less than 10 miles.....	20	0555	
Limestone—Carried 10 miles or more.....	05	0246	
Carried less than 10 miles.....	18	0555	
Iron ore—Carried 10 miles or more.....	05	0246	
Carried less than 10 miles.....	18	0555	
Undressed stone or lumber—Carried 10 miles or more.....	05	0318	
Carried less than 10 miles.....	20	0555	

Rate per 100 pounds for loading and unloading—No charge.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Location, or how designated—Rock Creek, Ohio.

Construction—Howe truss.

Material—Wood.

Length—26 feet, rebuilt.

Trestles in Ohio—Length filled and converted into embankment, 259 feet.

converted into open culverts under 4 ft. span, 30 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, 90c.), 233½ rods.

Ballasting—Miles of main track ballasted, 8.94 miles.

Rail laid—Steel, 60 lbs. per yard, miles of track, 3.50.

Train mileage—Passenger.....	58,131
Freight.....	160,578
Construction.....	998

Total.....

219,707

Car mileage—Passenger.....	105,898	
Express and baggage.....	59,990	
Freight—loaded .....	1,667,534	
empty .....	450,469	
Caboose.....	89,827	
<hr/>		
Total .....		2,373,718
Fuel consumed—Wood, 305 cords; coal, 6,255 tons; total cost.....		\$11,750 88
Losses, etc., paid—On goods and baggage .....		58 83
For animals killed in Ohio—Cattle.....		368 97

## TRANSPORTATION.

Passengers—Number carried, local .....	77,028	
Average number carried in each car per trip.....	10.5	
Average number of miles traveled by each.....	14.4	
Total mileage, or number carried one mile.....	1,113,324	
Average amount received for each .....	38.4 cents.	
Average amount <i>per mile</i> received for each.....	2.6	"
Freight—Tons carried, local.....	482,318	
Average tons in each loaded car per trip.....	13	
Average tons in each loaded car per mile.....	13	
Total movement, or tons carried one mile.....	21,734,079	
Average amount received for each ton.....	55.124 cents.	
Average amount <i>per mile</i> received for each ton.....	01.223	"
Average cost per ton freight per mile.....	.623	"
Average amount received for each ton local freight .....	55.124	"
Average cost each ton local freight.....	28.09	"

## Articles transported:

	Tons.	Per cent.
Coal .....	137,514	28.51
Coke .....	63,151	13.11
Stone, lime, sand, etc.....	22,398	04.65
Petroleum .....	237	00.05
Ores.....	196,218	40.68
Pig and bloom iron.....	15,168	03.14
Manufactured iron .....	7,264	01.50
Lumber and other forest products.....	16,232	3.36
Grain, flour, and other agricultural products.....	3,931	00.82
Live stock.....	3,159	00.65
Animal products .....	1,804	00.37
Manufactures, including agricultural implements.....	7,317	01.52
Merchandise .....	3,132	00.65
Miscellaneous .....	4,793	00.99

Total tonnage yielding revenue .....	482,318	100
Supplies for company's use .....	7,172	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local.....	\$29,637 85
Freight transportation—local.....	265,875 65
Mail service.....	2,734 76
Express service .....	1,711 12
Other sources .....	3,485 30

Total earnings of line operated included in this report..... \$303,444 68

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$66,022 68
Maintenance of cars .....	12,802 59
Motive power .....	40,283 26
Conducting transportation .....	59,423 56
General expenses:	
Taxes in Ohio.....	\$8,155 92
Salaries .....	2,144 42
Other general expenses of operating.....	975 47
	<u>\$11,275 81</u>

Total operating expenses, being 62.551 per cent. of earnings..... \$189,807 90

Net earnings of 62.604 miles operated..... 113,636 78

Rentals paid, etc.:

Hire of equipment.....	8,431 70
Net income over operating expenses and rents paid.....	105,205 08
Per mile of earnings, \$4,847.04 ; proportion for Ohio (62.604 miles).....	303,444 68
Per mile of operating expenses, \$3,031.88; proportion for Ohio.....	189,807 90
Per mile of net earnings, \$1,815.16 ; proportion for Ohio.....	113,636 78

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	August 8, 1880 .....	Louis C. Miller.....	Don't know.....	Lying on track drunk	Killed.
2	May 13, 1881.....	Minor son of John Bowley, of Youngstown (deaf and dumb) .....	.....	Walking on track.....	Killed.
3	June 23, 1881 .....	Ed. Whalen.....	Don't know.....	Fell under car.....	"

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Other than passengers or employes run over in yards, on sidings, or in switching .....	1
Other than passengers or employes lying, walking, falling, or being on track .....	2
Total.....	3



## RECAPITULATION.

Killed—Other than passengers or employes—stealing rides .....	1
trespassing, on track, etc.....	2
Total killed.....	3

*State of Pennsylvania, County of Allegheny, ss.:*

THOS. D. MESSLER, Third Vice President of the Pennsylvania Company, operating the Ashtabula and Pittsburgh Railway, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief

(Signed)

THOS. D. MESSLER,

[SEAL OF R. R.]

*Third Vice President.*

Subscribed and sworn to before me, this 9th day of September, A. D. 1881.

FRANK SEMPLE,

[SEAL.]

*Notary Public.*

**BALTIMORE AND OHIO AND CHICAGO RAILROAD COMPANY,  
AND BALTIMORE AND OHIO RAILROAD  
COMPANY OPERATING.**

Name of road: Baltimore and Ohio and Chicago Railroad.  
 By whom owned: Baltimore and Ohio and Chicago Railroad Company.  
 By whom operated: Baltimore and Ohio Railroad Company.  
 Name of company making this report: Baltimore and Ohio Railroad Company.  
 General office at Baltimore, Md.  
 Principal office in Ohio at Newark, O.  
 Address correspondence relating to this report to J. Hope Sutor, at Zanesville, O.

**NAME, TITLE, AND ADDRESSES OF OFFICERS.**

Name.	Office.	Address.	Salary.
Jno. King, Jr.....	President .....	Cincinnati, O .....	.....
J. Hope Sutor .....	Secretary .....	Zanesville, O .....	.....
	Treasurer .....		
W. T. Thelin .....	Auditor .....	Baltimore, Md.....	.....
Jas. L. Randolph.....	Chief Engineer .....	" .....	.....
C. K. Lord .....	General Passenger Agent.....	" .....	.....
M. H. Smith.....	General Freight Agent.....	" .....	.....
L. M. Cole.....	General Ticket Agent .....	" .....	.....

**DIRECTORS.**

Name.	Residence.	Name.	Residence.
Jno. King, Jr. ....	Cincinnati, O.	Wm. Franklin .....	Newark, O.
Wm. Keyser .....	Baltimore, Md.	Henry Newbegin.....	Defiance, O.
Jno. K. Cowen .....	Baltimore, Md.	A. P. Edgerton .....	Hicksville, O.
Geo. R. Dennis.....	Frederick, O	Washington Cowen.....	Mansfield, O.
David Lee.....	Zanesville, O.		

**CAPITAL STOCK.**

Capital stock authorized by law .....	\$12,000,000 00
Amount—common—issued.....	1,503,450 00
Par value of each share.....	50 00
Average amount paid in per mile of single main track (262.60 miles)...	5,725 24
Proportion of same for Ohio (110.31 miles) .....	13,629 31
Stockholders, residents of Ohio .....	4
Amount of stock held by them June 30, 1881.....	250 00

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Sterling.....	On line of road..	June, 1877	June 1st, 1927.	6 %	£1,600,000 (\$7,744,000)	£1,600,000
Total .....	.....	.....	.....	.....	\$7,744,000	£1,600,000

Average amount per mile of single main track (262.60 miles) \$29,489 71

Proportion of same for Ohio (110.31 miles)..... 70,202 15

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$3,685,148 93
Average amount per mile of single main track (262.60 miles).....	14,033 31
Proportion of same for Ohio (110.31 miles) .....	33,407 20
Increase since June 30, 1880.....	262,704 92
Total of paid in stock and debt.....	12,932,598 93
Total average amount per mile (262.60 miles) .....	49,248 28
Proportion of same for Ohio (110.31 miles) .....	117,238 68

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

Expenditures prior to July 1, 1880.....	\$11,778,569 23
Expenditures for the year ending June 30, 1881 .....	258,320 60

Total expenditures to July 1, 1881..... \$12,036,889 83

## COST OF EQUIPMENT OWNED BY COMPANY.

364 box freight cars.....	180,960 72
Balance of equipment owned by Baltimore and Ohio Railroad Company.	

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Chicago J'n, O., to Baltimore J'n, Ill...	262.60 miles.	110.31 miles.
Aggregate of sidings and other tracks .....	40.14 "	18.19 "
Total length laid with rail computed as single track...	302.74 miles.	128.50 "
Laid with steel rail.....	98.50 "	
Length in Ohio, distributed as follows :		

County.	Main track.	Sidings, etc.	Total.
Huron .....	5.79	4.03	9.82
Seneca .....	31.46	3.46	34.92
Hancock .....	5.63	.53	6.16
Wood .....	18.57	2.92	21.49
Henry .....	18.51	3.19	21.70
Defiance .....	30.35	4.06	34.41
Totals .....	110.31	18.19	128.50
Steel rail .....	45.50	None.	45.50

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Illinois Central, Baltimore Junction to Chicago.....	8.40 miles.	None.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft. 8 $\frac{1}{4}$ in.
Grade in Ohio—Maximum, per mile .....	33 feet.
Longest maximum east of Republic.....	$\frac{3}{4}$ mile.
Aggregate length of maximum.....	$\frac{3}{4}$ "
Curvature in Ohio—Shortest radius east of Maumee river .....	2,865 feet.
Aggregate length of shortest radius.....	5,254 "
Aggregate length of all radii .....	36,193 "
Aggregate length of tangent.....	103.46 miles.
Rail—Iron—On road.... { Side track.....	40.14 "
{ Main track.....	164.10 "
Average weight per yard .....	62 and 64 lbs.
Steel—On road .....	98.50 miles.
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	3,000.
Number laid during the year.....	168,937.
Ballasted—On whole line .....	262.60 miles.
In Ohio .....	110.31 "
With gravel, cinders and stone.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood..... 1; greatest age .....	8 years; aggregate length.....	188 ft.
Iron ..... 6;       "       ..... 8   "   ;       "       .....		1,551 ft. 8 in.
Total.....		1,740 ft. 8 in.
Trestles—164; greatest age, 8 years; greatest height, 30 ft.; greatest length, 1,131 ft.; aggregate length, 10,889 ft. 6 in.		

Length of shortest span of truss, 28 ft.; of longest, 153 ft. 4 in.; greatest length of beams between points of support, if not trussed, 15 ft.

Greatest space between cross ties upon bridges and trestles, 10 inches; length of ties, 9 ft.

Number of track stringers, 2 and 3.

Are all bridges and trestles provided with guard rails? Partially.

Do all bridges and trestles receive stated examinations? Yes.

How often? Daily by trackmen, and monthly or oftener by Superintendent of bridges.

Are the examinations analytical, and are they made by a competent person? Yes.

Fencing—Average and aggregate cost.	Whole line.	In Ohio.
Number miles fencing, computed as a single line.....	468.30	191.72
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.10).....	448 00	171 42
Rail (average cost per rod, \$0.90) .....	20 30	20 30

Length of road unfenced, and the reason therefor: 8.95 miles through towns not requiring fence (or 17.90 miles fence).

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

North Western Ohio Railroad at Tiffin.

I., B. and Western Railway, Ohio Division, at Tiffin.

Ohio Central Railroad at Fostoria.

Columbus and Toledo Railroad at Fostoria.

Lake Erie and Western Railway at Fostoria.

Dayton and Michigan Railroad at Deshler.

Toledo, Delphos and Burlington Railroad at Holgate.

Wabash, St. Louis and Pacific Railway at Defiance.

	In Ohio.
Number of crossings of highways at grade in this State without protection.....	126
“ “ “ over railroad .....	2
“ “ “ under railroad.....	5
“ highway bridges 18 feet above track.....	2

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated.....	271; in Ohio, 110.31
Miles of same owned by railroad company.....	271; “ 110.31

## STATIONS.

Passenger and freight (number) .....	48; in Ohio, 20
Number with telegraph communication.....	34; " 15
Number of same operated by railroad company.....	34; " 15

## ROLLING STOCK.

Equipment owned by B. & O. R. R. Co., except 364 freight cars.
Number of locomotives equipped with train brakes, 20.
Kind of brake: Loughridge air brakes.
Number of cars equipped with train brakes: all passenger, baggage, express and mail.
Kind: Loughridge air brake.
Number of passenger cars with "Miller Platform": none—but all are equipped with the Janney coupler and platform.
Method of bridging between passenger cars, when two or more are run in trains:
Movable wooden bridges secured by a chain, between cars not equipped with Janney platform.
State methods of heating cars used for the transportation of passengers: Baker's patent heaters and wood stoves with door-locks.
Means of lighting same: Mineral sperm oil and candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation, " .....	15 "
Freight trains, " .....	12 "

## EMPLOYEES.

General Manager.....	1
Master of Transportation .....	1
" Road .....	1
Assistant Master of Road .....	1
" " Machinery .....	5
Telegraph operators .....	34
Engineers.....	76
Baggagemen .....	14
Flagmen, switch-tenders and watchmen .....	49
Laborers .....	241
Clerks .....	67
Train dispatchers.....	4
Firemen .....	76
Wipers .....	16
Mechanics .....	263
Conductors.....	30
Brakemen .....	60
Station agents .....	37

Section men.....	427
Other employes .....	91
<hr/>	
Total number employed by company in operating line.....	1490
Proportion for Ohio.....	604

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: B. & O. R. R. runs its own express.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Rails... {	Iron .....	7	Ties—Oak .....	6	
	Steel. Not used long enough to determine.		Bridges—Wooden.....	15	
Frogs .....		3	Telegraph poles—Cedar .....	8	
			Fence posts.....	8	

## DOINGS OF THE YEAR ENDING JUNE 30.

Trestles in Ohio—Length filled and converted into embankment, 1500 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, \$1.10),  $2\frac{1}{2}$  miles in Ohio.

Ballasting—Miles of main track re-ballasted with stone 1 mile; gravel, 4 miles; in Ohio, all.

Rail laid—Steel, 60 lbs. per yard—miles of track, 77.87; in Ohio, 20 miles.

Train mileage—Passenger.....	482,414
Freight .....	857,535
Construction .....	Not kept.

Total ..... 1,339,949

Car mileage—Passenger.....	1,628,255
Express, baggage and mail.....	792,767
Freight—loaded.....	15,981,875
Freight—empty .....	5,156,561

Total ..... 23,559,458

Fuel consumed—Wood, 817 cords; coal, 87,468 tons. Total cost..... \$100,597 46

Losses, etc., paid—For animals killed in Ohio:

Six cattle .....	\$84 00
Thirteen sheep.....	51 00

Total ..... \$135 00



## TRANSPORTATION.

Passengers—Number carried.....	224,409
Average number of miles traveled by each .....	85.2
Total mileage, or number carried one mile.....	19,119,647
Average amount received for each .....	\$1 50
Average amount <i>per mile</i> received for each.....	1.76 cts.
Freight—Tons carried, local.....	123,309
Tons carried, through.....	527,091
Total .....	650,400

## Articles transported :

	Tons.	Per cent.
Coal .....	66,951	08.92
Stone, lime, sand, etc.....	7,318	00.98
Petroleum .....	1,185	00.16
Ores .....	2,331	00.31
Pig and bloom iron.....	20,931	02.79
Manufactured iron .....	5,399	00.72
Lumber and other forest products.....	89,996	11.99
Grain, flour, and other agricultural products.....	234,927	31.30
Live stock.....	41,297	05.50
Animal products .....	44,788	05.97
Manufactures, including agricultural implements.....	25,972	03.46
Merchandise .....	26,420	03.52
Miscellaneous .....	182,935	24.38
Total tonnage yielding revenue .....	750,450	100
Supplies for company's use.....	Not kept.	

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation.....	\$336,774 68
Freight transportation.....	1,208,657 82
Mail service.....	58,511 07
Total earnings of line operated included in this report.....	\$1,603,943 57

## OPERATING EXPENSES.

Maintenance of way and structures....	\$316,587 44
Maintenance of cars .....	136,607 21
Motive power .....	151,744 19
Conducting transportation .....	459,422 10

## General expenses:

Taxes in Ohio.....	\$20,243 17
“ Indiana.....	\$20,817 07
“ Illinois.....	12,292 82
	<hr/> 33,109 89
Other general expenses of operating.....	56,220 87
	<hr/> \$109,573 93

Total operating expenses, being 82.33 per cent. of earnings.....\$1,173,934 87

Net earnings of 271 miles operated ..... 430,008 70

Net income over operating expenses and rents paid..... 430,008 70

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt ..... \$262,704 92

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Construction of new work..... \$258,320 60

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Sterling debt (due 1927), £1,600,000, @ \$4.84.....	\$7,744,000 00
Floating debt.....	3,685,148 93
Stock .....	1,503,450 00
	<hr/> \$12,932,598 93

## ASSETS.

Cost of road.....	\$12,036,889 53
Rolling power .....	180,960 72
	<hr/> \$12,217,850 25
Sinking fund .....	162,665 14

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880.				
1	Aug. 12	Geo. Johnson.....	Laborer.....	Clamp of derrick car fell.....	2 finger's cut off.
2	27	G. M. Williams.....	".....	Getting on train in motion.....	Foot injured.
3	Sept. 5	A. T. Sanderson.....	Engineer.....	Engine thrown from track; run over cow.....	Killed.
4	15	Wm. Foster.....	Switchman .....	Fell from train; run over; intoxicated.....	Both legs inj'd.
5	Nov. 26	Jno. Fulmer.....	Citizens .....	Driving across track.....	Killed.
6	26	Mrs. Fulmer.....			
7	26	Mrs. Halzil.....			
	1881.				
8	Jan. 24	Wm. Blair .....	Fireman .....	Collision .....	"
9	29	H. H. Sewer.....	Citizen .....	Getting on train in motion.....	"
10	Feb. 10	John Ryan.....	Laborer.....	Fell from train; run over.....	"
11	Mar. 15	A. Black .....	Brakeman .....	Coupling .....	Hand injured.
12	18	D. M. Copper.....	".....	".....	"
13	May 22	Fred. Parker.....	Boy .....	Getting on train in motion .....	Killed.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Falling or thrown from engine or train .....	1
Collisions, and standing on platform of car during same.....	1
Engine or train leaving or thrown from track.....	1
Others—Getting on or off engine or train in motion.....	2
Riding or driving across track.....	3
Total.....	8

## PERSONS INJURED—CAUSES.

Employees—Getting on or off engine or train in motion .....	1
Coupling, or caught between cars and engine.....	2
Falling or thrown from engine or train .....	1
Miscellaneous.. .....	1
Total.....	5

## RECAPITULATION.

Killed—Employees—from causes beyond their control.. .....	3
Others—at stations and highway crossings .....	3
stealing rides .....	1
trespassing on track, etc.....	1
	5
Total killed .....	8
Injured—Employees—from causes beyond their control .....	1
misconduct or want of caution .....	4
Total injured.....	5

## TRAIN ACCIDENTS—ENTIRE LINE.

Number.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
	1880.				
1	July 9	Hamlin .....	Freight.....	Cattle on track .....	5 box cars damaged.
2	July 13	Tiffin.....	" .....	Door of side dump car being open, threw cars of passing train off track.....	5 cars damaged.
3	Aug. 31	Sherwood .....	" .....	Misplaced switch.....	6 cars damaged.
4	Aug. 12	Bloomdale .....	" .....	Cattle on track.....	1 engine and 7 cars damaged.
5	Sept. 5	Holgate .....	" .....	Cattle on track .....	6 cars damaged.
6	Sept. 8	White's Mills.....	" .....	Falling mass.....	3 cars damaged.
7	Sept. 10	Deance.....	" .....	Collision: train broke in two...	5 cars damaged.
8	Sept. 13	Postoria .....	" .....	Broken axle.....	1 car damaged.
9	Oct. 15	Deshler.....	" .....	Cattle on track.....	1 engine damaged.
	1881.				
10	Jan. 24	Tiffin .....	" .....	Collision; rear .....	1 engine and 1 car damaged.
11	Feb. 25	Chicago Junction ...	" .....	Collision; butting .....	2 engines damaged.
12	Feb. 28	Chicago Junction ...	" .....	Misplaced switch.....	1 engine and 1 car damaged.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	8
Accidents not resulting in derailment of train.....	1
Collisions—butting.....	1
rear.....	2
<hr/>	
Total accidents .....	12

## Causes of accidents effecting derailment of trains:

Cattle on track .....	4
Falling mass.....	1
Misplaced switch (purposely) .....	2
Other causes .....	1
<hr/>	
Total.....	8

## Causes of collisions:

Cars on main track .....	1
Train breaking in two.....	1
Other causes .....	1
<hr/>	
Total.....	3

## Causes of accidents not resulting in derailment of trains:

Broken axle .....	1
<hr/>	
Total.....	1
Total derailments.....	8
Total collisions .....	3
<hr/>	
Total accidents .....	12

*State of Ohio, County of Licking, ss.:*

B. Dunham, General Manager of the Baltimore and Ohio Railroad Company, operating the Baltimore and Ohio and Chicago Railroad, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

B. DUNHAM,  
General Manager.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 8th day of November, A. D. 1881.

[SEAL.]

EDWARD KIBLER,  
Notary Public, Licking County, Ohio.

## BALTIMORE SHORT LINE RAILWAY COMPANY.

Name of road : Baltimore Short Line Railway.

By whom owned : Baltimore Short Line Railway Company.

By whom operated : Receiver of Marietta and Cincinnati Railroad Company, as organized.

By what authority : Lease to Marietta and Cincinnati Railroad Company, as reorganized.

Name of company making this report : Baltimore Short Line Railway Company.

General office at Cincinnati, Ohio.

Principal office in Ohio at Athens, Ohio.

Address correspondence relating to this report to Charles F. Low, Secretary, at Cincinnati, Ohio.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
John Waddle .....	President.....	Cincinnati, O .....	\$500 00
Charles F. Low.....	Secretary .....	Cincinnati, O .....	.....
Wm. E. Jones .....	Treasurer and Registrar ..	Cincinnati, O .....	.....
Total salary .....	.....	.....	\$500 00

### DIRECTORS.

Name.	Residence.	Name.	Residence.
John Waddle .....	Chillicothe, O.	George Dana .....	Belpre, O.
Wm. T. McClintick .....	Chillicothe, O.	D. B. Stewart.....	Athens, O.
John King, Jr.....	Cincinnati, O.	R. De Steigner .....	Athens, O.
Robert Garrett .....	Baltimore, Md.		

### CAPITAL STOCK.

#### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$1,250,000 00
Number of shares—common.....	25,000
Par value of each—common.....	50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	1,250,000 00	
Amount subscribed—common.....	1,244,850 00	
Total paid in capital stock—common .....	1,244,490 00	
Average amount paid in per mile of single mile track (30.33 miles).....		\$41,031 65
Proportion of same for Ohio.....( All ).....		.....

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	Amount of common.
For subscriptions paid in cash.....	\$1,244,850

Stockholders, residents of Ohio, 7.

Amount of stock held by them June 30, 1881..... \$1,550 00

Agents authorized to transfer stock: General office, Cincinnati, Ohio.

Number of shares transferred within the year at such agencies, 2.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of in- terest.	6. Amount of author- ized issue.	7. Amount actually issued.
First mortgage...	Mortgage....	Dec. 1874	Dec. 1904	7	\$750,000 00	\$750,000 00

Average amount per mile of single main track (30.33 miles)... \$24,727 99

*State of Ohio, County of Hamilton, ss.:*

John Waddle, President of the Baltimore Short Line Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement, as far as the same purports to be made, of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

JOHN WADDLE.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 27th day of October, A. D. 1881.

WILLIS H. WIGGINS,

Notary Public, Hamilton County, Ohio.

[SEAL]

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R.R.C.

## BELLAIRE AND SOUTHWESTERN RAILWAY COMPANY.

Name of road: Bellaire and Southwestern Railway.

By whom owned: Bellaire and Southwestern Railway Company.

By whom operated: Bellaire and Southwestern Railway Company.

Name of company making this report: Bellaire and Southwestern Railway Company.

General office at Woodsfield, Ohio.

Principal office in Ohio at Woodsfield, Ohio.

Address correspondence relating to this report to M. Hoeffler, Secretary, at Woodsfield, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Detailed statement of organization, construction, etc., has been made in previous report.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salaries.
S. L. Mooney.....	resident.....	Woodsfield, O.....	\$2,000
Wm. M. Armstrong.....	Vice President.....	Armstrong's Mills.....	
M. Hoeffler.....	Secretary.....	Woodsfield, O.....	660
W. C. Mooney.....	Treasurer.....	".....	
S. J. Cochran.....	General Freight Agent.....	Bellaire.....	1,020
W. T. Morris.....	} Executive Committee..	Woodsfield, O.....	
A. H. Caldwell.....		Alledonia, O.....	
Wm. M. Armstrong.....		Armstrong's Mills, O.....	
Henry Miller.....		Beallsville, O.....	
T. A. Welsh.....		Armstrong's Mills, O.....	

### DIRECTORS.

Name.	Residence.	Name.	Residence.
S. L. Mooney.....	Woodsfield.....	John Keyser.....	Beallsville.
W. T. Morris.....	".....	A. H. Caldwell.....	Alledonia.
M. Hoeffler.....	".....	Alex. Armstrong.....	Armstr'g's Mills.
C. Weber.....	Lewisville.....	T. A. Welsh.....	"....."
A. B. Covert.....	Antioch.....	W. M. Armstrong.....	"....."
Henry Miller.....	Beallsville.....	T. H. Armstrong.....	Woodsfield.



CAPITAL STOCK.

CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$500,000 00
Number of shares—common .....	10,000
Par value of each—common .....	\$50

CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$600,000 00
Amount subscribed—common .....	234,700 00
Total paid in capital stock—common .....	167,498 85
Increase since June 30, 1880—common .....	317 18
Average amount paid in per mile of single main track (42 miles).....	3,988 06
Proportion of same for Ohio (42 miles).....	All.

CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.
For subscription paid in municipal, county or town bonds.....	None.	\$124,200 00
For subscriptions paid in cash.....	2,484	5,650 00
For services rendered.....	113	.....
For original construction .....	165	8,250 00
Total .....	2,762	\$138,100 00

Stockholders, residents of Ohio (number).....	898
Amount of stock held by them June 30, 1881 .....	\$137,250 00
Agents authorized to transfer stock: M. Hoeffler, Woodsfield, O.	
Number of shares transferred within the year at such agencies .....	120

FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage..	Road and equipment..	July 1, 1879..	July 1, 1899...	6	\$250,000 00	\$250,000 00
2d .....	" .....	Apr. 1, 1880...	Apr. 1, 1890...	6	75,000 00	75,000 00
Total .....	.....	.....	.....	.....	.....	\$325,000 00

Average amount per mile of single main track (42 miles).....	\$7,735 71
Increase since June 30, 1880.....	75,000 00

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$9,916 00	
All other debts, current credit balances, etc.....	4,626 00	
Total unfunded debt.....	\$14,542 00	
Cash securities, debit balances, etc., available to payment.....	14,542 00	
Decrease since June 30, 1880 .....	1,095 24	
Total of paid in stock and debt.....		\$492,498 85
Total average amount per mile .....	\$11,726 16	
Proportion of same for Ohio .....		All.

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expend- itures to July 1, 1881.
Right of way.....	\$10,421 87		\$10,421 87
Civil engineering.....	33,835 71	\$35 00	33,890 71
Grading and masonry .....	233,856 28		233,856 28
Bridges.....	8,655 59		8,655 59
Timber and ties.....	20,344 06	450 00	20,794 06
Superstructure (included in 5th and 7th items.)			
Iron rails, chairs and spikes.....	86,340 33		86,340 33
Fencing.....	262 14		262 14
Passenger and freight stations. ....	1,460 00		1,460 00
Engine and car houses.....	1,037 00		1,037 00
Machine shops, machinery and fixtures.....	500 00		500 00
Interest and discount.....	17,392 30		17,392 30
Contingent expenses .....	9,930 55		9,930 55
Total expenditures for construction.....	\$424,055 83	\$485 00	\$424,540 83

## ROAD ACQUIRED BY PURCHASE.

Total expended for construction and purchase .....	\$424,540 83
Average cost per mile of road constructed (single main track, 42 miles)..	10,108 12
Average cost per mile of road owned by company (single main track, 42 miles), all in Ohio.....	10,108 12

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 3 .....	\$17,000 00
First class passenger cars, 1 .....	2,200 00
Second class passenger cars, 1.....	2,000 00
Box freight cars, 4.....	2,100 00
Platform cars, 23 .....	5,520 00
Mail and express baggage cars, 1 ..	1,800 00

Hand cars, 8 .....	450 00
Caboose cars, 1 .....	450 00
All other rolling stock, tools, machinery, etc.....	202 00

Total cost of railroad equipment owned by company.....	\$32,472 00
Additions within the year ending June 30, 1881 .....	267 00
Average amount per mile (of single main track, 42 miles).....	773 14
Proportion for Ohio, 42 miles.	All.
Total for road and equipment .....	457,012 83
Total average amount per mile (of single main track, 42 miles) .....	10,881 25
Proportion of same for Ohio, 42 miles.	All.

### CHARACTERISTICS, Etc.

#### PROPOSED LINES.

From Woodsfield via Summerfield to Caldwell—33 miles.  
Proposed gauge, 36 inches.

#### LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Bellaire to Woodsfield .....	42.00 miles.	All.
Aggregate of sidings and other tracks.....	1.32 "	1.32 miles.

Total length laid with rail computed as single track... 43.32 miles. 43.32 miles.  
Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Belmont.....	27.50	1.07	28.57
Monroe .....	14.50	0.25	14.25
Totals .....	42.00	1.32	43.32
Steel rail .....	None .....		

#### GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	3 feet.
Grade—Maximum, per mile.....	132 feet.
Longest maximum .....	21,000 feet.
Aggregate length of maximum .....	57,300 "
Curvature—Shortest radius .....	410 "
Aggregate length of shortest radius .....	30,380 "
Aggregate length of all radii .....	107,423 "
Aggregate length of tangent .....	21.29 miles.
Rail—Iron—On road.....	42 miles.
Average weight per yard .....	35 lbs.
Ties—Average number per mile.....	2,750.
Ballasted—On whole line.....	42 miles.
In Ohio .....	42 "
With rock and gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood..... 38; greatest age..... 3 years; aggregate length..... 1,564 feet.  
 Combination.. 1; “ ..... 4 “ ; “ ..... 120 “

Total..... 1,684 feet.

Trestles—39; greatest age, 3 years; greatest height, 45 feet; greatest length, 500 ft.; aggregate length, 1,856 feet.

Length of shortest span of truss, 30 ft.; of longest, 125 ft.; greatest length of beams between points of support, if not trussed, 20 ft.

Greatest space between cross ties upon bridges and trestles, 9 inches; length of ties, 7 feet.

Number of track stringers, 4.

Are all bridges and trestles provided with guard rails? No.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent person? Yes, by road master.

Tunnels—Wood, 1; length, 196 feet.

Fencing—Average and aggregate cost.

Whole line. In Ohio.

Number miles fencing, computed as single line ..... 30 30

Kind of fencing, as follows:

Post and board, mostly built by landowners.

Average cost of fencing, \$2,400.

Average cost of same per rod, \$1.50.

Length of road unfenced, and the reason therefor: Not known.

## CROSSINGS.

Number of crossings of highways at grade in the State without protection ..... 8

“ “ “ over railroad ..... 3

“ “ “ under railroad..... 1

Number highway bridges 18 feet above track..... 3

Do all trains stop at railroad crossings as required by law? Do not cross any railroad.

## STATIONS.

Passenger and freight, in Ohio ..... 8

## ROLLING STOCK.

Locomotives..... 3; Owned by company reporting..... 36,000 00

Express and baggage cars..... 1; ..... 12,000 00

Passenger cars ..... 3; ..... 14,000 00

Freight cars..... 4; ..... 10,000 00

Other cars ..... 23; ..... 8,500 00

Number of locomotives equipped with train brakes, 3.

Kind of brake: Eames' Vacuum.

Number of cars equipped with train brakes, 4.

Kind: Eames' Vacuum.

Number of passenger cars with "Miller Platform", none.

Method of bridging between passenger cars, when two or more are run in trains:

Wooden platform secured by chain.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Stoves well secured, heated with coal.

Means of lighting same: Candles.

SPEED OF TRAINS.

Express passenger, average rate, including stops .....	14 miles per hour.
Mail and accommodation, .....	10 "
Freight trains, .....	10 "

EMPLOYES.

Superintendents.....	2
Engineers.....	3
Baggagemen .....	1
Laborers .....	8
Clerks .....	1
Firemen.....	3
Wipers.....	2
Mechanics .....	5
Conductors.....	2
Brakemen.....	4
Station Agents .....	12
Section men .....	40
Other employes .....	4

Total number employed by company in operating line..... 87 .

Proportion for Ohio..... 87

AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in Years.
Locomotives .....	{ Passenger .....	10	Rails—Iron.....		10
	{ Freight.....	10	Joint fastenings .....		10
Cars .....	{ Passenger .....	15	Frogs .....		5
	{ Baggage .....	15	Ties—Oak .....		7
	{ Box .....	10	Bridges .....	{ Wooden .....	12
	{ Stock.....	10		{ Trestles.....	10
	{ Coal .....	12		{ Piling .....	10
	{ Flat .....	12	Fence posts .....		20

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams Express Co.

Terms: Twenty-five dollars per month, and five cents per hundred weight in addition to first class rates.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles .....	03.75 Cts.	03.65 Cts.	03.70 Cts.
For distances over 8 miles—1st class .....	3.00	2.50	2.75
Excursion.....	2.00	1.20	1.60
Amount charged in addition to regular fares, in sleeping or other cars run on your road: No sleeping cars.			

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

	Highest.	Lowest.	Average.
First class.....	0.59 Cts.	0.47 Cts.	0.53 Cts.
Second class.....	0.54	0.42	0.48
Third class.....	0.32	0.18	0.20
Special class.....	0.10	0.10	0.10

Rate per ton per mile on freight carried less than 30 miles:

First class .....	5.41	5.00	5.20
Second class.....	4.58	4.16	4.37
Third class .....	3.75	2.91	3.33
Special class .....	0.83	0.83	0.83

Rate per ton per mile on freight carried more than 30 miles:

First class.....	4.76	4.46	4.61
Second class.....	3.57	2.97	2.77
Third class .....	2.38	2.08	2.23
Special class.....	0.59	0.59	0.59

Rate per ton per mile for—

Coal—Carried ten miles or more .....	1.85	1.85	1.85
Carried less than ten miles .....	4.32	4.32	4.32
Limestone—Carried ten miles or more.....	2.38	2.38	2.38
Carried less than ten miles.....	4.93	4.93	4.93
Undressed stone or lumber—Carried 10 miles or more	3.17	2.11	2.64
Carried less than 10 miles	5.77	5.77	5.77

Rate per 100 lbs. for loading:

First class.....	0.93	0.93	0.93
Second class.....	0.93	0.93	0.93
Third class.....	0.45	0.45	0.45
Special class.....	0.25	0.25	0.25

## Rate per 100 lbs. for unloading:

First class.....	0.93	0.93	0.93
Second class.....	0.93	0.93	0.93
Third class.....	0.45	0.45	0.45
Special class.....	0.25	0.25	0.25

## DOINGS OF THE YEAR ENDING JUNE 30.

Ballasting—Miles of main track ballasted with rock and gravel, 10.

Train mileage—Passenger.....	27,544	
Freight.....	27,142	
Mixed.....	28,552	
Construction.....	15,600	
Total.....		98,838

Car mileage—Passenger.....	79,716	
Express and baggage.....	26,292	
Freight—loaded.....	105,168	
Freight—empty.....	35,056	
Caboose.....	6,820	
Construction and other.....	9,214	
Total.....		262,866

Fuel consumed—Wood, 52 cords; coal, 1,260 tons. Total cost.....	\$1,836 50
Losses, etc., paid—On goods and baggage.....	21 55

For injuries in Ohio, fatal and non-fatal:

To passengers.....	\$586 45	
To employes.....	19 00	
Total.....		\$72 00

For animals killed in Ohio:

Three cattle.....	\$57 50	
Eight sheep.....	17 50	
One hog.....	3 00	
Total.....		\$77 00

Amount claimed in litigation, etc., for injuries in Ohio to persons.....	5,000 00
--	----------

## TRANSPORTATION.

Passengers—Number carried, local.....	36,803	
through.....	4,177	
Total.....		40,980
Average number carried in each car per trip.....		24
Average number of miles traveled by each.....		14.62
Total mileage, or number carried one mile.....		607,140
Average amount received for each.....		44.41 cents.
Average amount <i>per mile</i> received for each.....		3 “



Freight—Tons carried, local.....	4,500	
through .....	6,016	
	<hr/>	
Total .....		10,516
Average tons in each loaded car per trip.....		7
Total movement, or tons carried one mile.....		383,172
Average amount received for each ton.....		\$1 69.55
Average amount <i>per mile</i> received for each ton .....		4.84 cents.
Average amount received for each ton through freight .....		\$1 80
Average amount received for each ton local freight.....		\$1 55.50
Articles transported: We keep no classified account of tonnage.		
Total tonnage yielding revenue.....		10,516
Supplies for company's use.....		240

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local .....	\$13,006 04	
through .....	5,221 25	
	<hr/>	
Total .....		\$18,227 29
Freight transportation—local.....	\$7,001 12	
through .....	10,829 80	
	<hr/>	
Total .....		\$17,829 92
Mail service.....		1,835 31
Express service .....		436 86
Other sources .....		681 34
		<hr/>
Total earnings of line operated included in this report.....		\$39,008 72

## OPERATING EXPENSES.

Maintenance of way and structure.....	\$14,024 69	
Maintenance of cars .....	1,824 09	
Motive power .....	6,012 58	
Conducting transportation .....	4,493 42	
General expenses:		
Taxes in Ohio.....	957 90	
Salaries .....	2,974 98	
Other general expenses of operating.....	2,503 22	
	<hr/>	
Total operating expenses, being 84.06 per cent. of earnings.....		\$32,790 88
Net earnings of 42 miles operated .....		6,217 84
Net income over operating expenses and rents paid.....		6,217 84
Percentage of same to capital stock and debt.....		1.24
Percentage of to total means applied to construction, etc. ....		1.24

Per mile of earnings, \$928.78; proportion for Ohio.....	All.
“ operating expenses .....	\$780 73
“ net earnings.....	148 05

CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

LIABILITIES.

Capital stock.....	\$167,498 85
Bond account .....	277,557 07
Income account .....	39,008 72
	<hr/> \$484,064 64

ASSETS.

Cost of road.....	\$457,012 83
Due from sundry accounts.....	14,051 81
Material and supply on hand .....	1,000 00
Real estate.....	12,000 00
	<hr/> \$484,064 64

ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	Oct. 14...	Vic. Burton ...	Brakeman...	Fell between cars, while train was in motion.....	Died six hours afterwards.

*State of Ohio, County of Monroe, ss.:*

Samuel L. Mooney, President of the Bellaire and Southwestern Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

Subscribed and sworn to before me, this 29th day of September, A.D. 1881.

[SEAL.]

S. L. MOONEY,

*Pres't B. & S. R'y Co.*

W. E. MALLORY,

*Notary Public, Monroe County, O.*

BOWLING GREEN RAILROAD COMPANY, HEIRS OF M. T.  
WIGGINS, LESSEE.

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Name of road: Bowling Green Railroad.

By whom owned: Bowling Green Railroad Company.

By whom operated: By heirs of M. T. Wiggins, Lessee from said Railroad Company.

By what authority: Lease for 99 years.

Name of person making this report: Wm. A. Wiggins, General Manager Bowling Green Railroad Company.

General office at Bowling Green, Wood county, Ohio.

Principal office in Ohio at same place.

Address correspondence relating to this report to Wm. A. Wiggins, General Manager, at Bowling Green, Wood county, Ohio.

HISTORY OF ORGANIZATION AND CONSTRUCTION.

The original charter is not under the control of the lessee making this report, but such facts as are within his knowledge are herewith submitted.

"The Bowling Green Railroad Company" was organized in the spring of the year 1874, and the Bowling Green Railroad was constructed by said company in the summer and fall ensuing. Second-hand *flat rail*, and second-hand engine and other equipments, purchased from the Carrollton and Oneida Railroad Company, being used in its construction and equipment.

The road was operated by said company until the latter part of December, 1875, when Mark T. Wiggins bought of said company all of the equipments and fixtures pertaining to the said road, and leased the road-bed, franchises, and all rights of said company belonging to the same, for the term of ninety-nine years, renewable forever, paying said company therefor the sum of ten thousand dollars (\$10,000.00).

Said road has been operated by said Wiggins and his legal representatives since the date of his said lease, until the present. Mark T. Wiggins having died on the 3d day of July, 1880, the road has since that time been, and is now, operated by his widow and two sons, Howard B. and Wm. A. Wiggins, by virtue and under the authority of an assignment of said lease made to them by said M. T. Wiggins, shortly before his death.

In the summer of 1877 the flat rail was replaced with new T rail, purchased of the Columbus Rolling Mill Company, at a cost of over \$13,000. New rolling stock has been supplied, road-bed ballasted and otherwise improved, all of which supplies and improvements have been paid for, so that the said road is in good order and well equipped for its business, and practically out of debt. Is run more as a private enterprise than a public concern. Is managed and conducted by the lessees in person, who share equally in the surplus earnings.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Wm. A. Wiggins, General Manager, Bowling Green, Ohio. Salary, share in profit.  
Howard B. Wiggins, Chief Engineer, Bowling Green, Ohio. Salary, share in profit.

## CAPITAL STOCK.

Lessee none to report.

## FUNDED DEBT.

Lessee none to report.

## INDEBTEDNESS—LESSEE.

Contracted for construction, equipment or real estate, balance last report...	\$2,200
Decrease since June 30, 1880.....	2,200
Total net debt liabilities, none.	

## COST OF ROAD EQUIPMENT, ETC.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1, 1881.
Right of way (included in purchase).....			
Civil engineering (included in purchase) .....			
Grading and masonry (by lessee, 1880).....	\$100 00		\$100 00
Bridges (by lessee, 1880) .....	200 00		200 00
Timber and ties (by lessee, 1880) .....	750 00	\$500 00	1,250 00
Superstructure (1875).....	450 00		450 00
Iron rails, chairs and spikes (1875).....	13,650 00	30 00	13,680 00
Passenger and freight stations (repairs) .....	50 00		50 00
Engine and car houses.....	300 00		300 00
Other buildings and fixtures (turn tables).....	200 00		200 00
Telegraph (in place of telephone) .....	400 00	200 00	600 00
Contingent expenses.....	500 00	500 00	1,000 00
Total expenditures for construction.....	\$16,600 00	\$1,230 00	\$17,830 00

## ROAD ACQUIRED BY PURCHASE AND LEASE.

Bowling Green Railroad Company (original cost unknown), purchased for .....	\$10,000 00	
Subsequent expenditure for construction .....	13,600 00	
	<hr/>	
Total expended for construction and purchase .....		\$23,600 00

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 2 (one included in original purchase) .....	\$2,200 00
Second-class passenger cars, 1 (included in purchase).	
Baggage cars, 1 (included in purchase).	

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Bowling Green to Tontogany.....	5.5	All.
Aggregate of sidings and other tracks.....	.5	
	<hr/>	
Total length laid with rail computed as single track.....	6.0	

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge—Standard.	
Grade—Practically level.	
Curvature—Line straight.	
Rail—Iron—On road.....	6 miles.
Average weight per yard.....	35 lbs.
Ties—Average number per mile .....	2,700
Number laid during the year.....	1,500
Ballasted—On whole line .....	6 miles.
With sand.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges are short wooden structures, over ditches only, and are from 5 to 15 feet long, and have abutments of timber or stone.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated and owned by lessee.....	5.5
---	-----

## STATIONS.

Passenger and freight.....	2
Number with telegraph communication.....	2
Number of same operated by railroad company .....	2
Is pay received for messages sent over line owned by railroad company ?	Yes.

## ROLLING STOCK.

Locomotives .....	2 ; weight, 10 and 18 tons respectively.
Express and baggage cars .....	1.
Passenger cars.....	1.

Above includes not owned by company reporting.

Freight cars, as required, owned by C., H. & D. R. R. Co.

Other cars, " " same.

Number of locomotives equipped with train brakes, 2.

Kind of brake : common.

Number of cars equipped with train brakes, 2.

Kind : common.

Method of bridging between passenger cars, when two or more are run in trains :  
Ordinary.

Are all cars run on this road heated and lighted as prescribed by law ? They are  
according to law.

Means of lighting same : Sperm candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	20 miles per hour.
Mail and accommodation, .....	20 "
Freight trains, .....	20 "

## EMPLOYES.

Superintendents (General Manager) .....	1
Telegraph operators .....	1
Engineers .....	1
Baggagemen .....	1
Firemen .....	1
Mechanics .....	2
Conductors.....	1
Brakemen.....	1
Station agents.....	1
Section men.....	2
Laborers .....	1

---

Total number employed by company in operating line..... 13  
Proportion for Ohio ..... All.

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road : No express office connected with road.  
Packages are carried to and from Tontogany as express freight by special  
arrangement with consignees and consignors.

## ANNUAL REPORT.

## RATES OF TRANSPORTATION.

## PASSENGER.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles...	4 $\frac{6}{10}$ Cts.	4 $\frac{6}{11}$ Cts.	4 $\frac{6}{11}$ Cts.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

First class.....	1 $\frac{1}{10}$ Cts.	1 $\frac{1}{5}$ Cts.	..... Cts.
Second class.....	1 $\frac{1}{10}$	1 $\frac{1}{5}$	.....
Third class.....	1 $\frac{1}{10}$	1 $\frac{1}{5}$	.....
Fourth class.....	1 $\frac{1}{10}$	1 $\frac{1}{5}$	.....
Fifth class .....	1 $\frac{1}{10}$	1 $\frac{1}{5}$	.....

Special class, per package, 15 cents for whole line.

Rate per ton per mile on freight carried less than 30 miles :

Fourth class—as above.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Ballasting—Miles of main track ballasted with sand (repaired), 5.5.

Fuel consumed—Wood, 100 cords ; coal, 175 tons ; total cost, \$750.00.

## TRANSPORTATION.

Passengers—Number carried, through .....	20,000
Average number of miles traveled by each .....	5.5
Total mileage, or number carried one mile.....	110,000
Average amount received for each.....	25 cents.
Average amount <i>per mile</i> received for each.....	4.54 “
Freight—Tons carried, through (17,884,808 lbs.) ; total.....	89,424,808

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30th.

## EARNINGS.

Passenger transportation—local and through.....	\$5,000 00
Freight transportation—local and through .....	4,847 50
Mail service.....	272 00
Express service (packages as by special arrangement) .....	240 00

Total earnings of line operated included in this report..... \$10,359 50

## OPERATING EXPENSES.

Maintenance of way and structures—Labor, etc.....	\$600 00
Maintenance of cars .....	50 00
Motive power.....	100 00
Conducting transportation.....	550 00

Total ..... \$1,300 00



## General expenses, as follows:

Taxes in Ohio .....	\$273 00	
Other general expenses of operating. ....	1,980 00	
<hr/>		
Total.....		2,253 00
<hr/>		
Total operating expenses being 30 per cent. of earnings.....		\$3,553 00
Net earnings of 5.5 miles operated.....		6,806 50
Rentals paid (freight cars, etc.).....		980 00
Net income over operating expenses and rents paid .....		5,826 50
Per mile of earnings.....	\$1,883 54; Proport'n for O. (5.5 miles)	10,359 50
operating expenses...	824 18; " " "	4,533 00
net earnings .....	1,059 36; " " "	5,826 50

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Gross earnings year ending July 1st .....	\$10,359 50	
	<hr/>	\$10,359 50

## ASSETS.

Indebtedness paid in full .....	Page 6.....	\$2,200 00	
Construction account for year.....	" 7.....	1,230 00	
Fuel account for year.....	" 15.....	750 00	
Operating expenses (labor, etc.) .....	" 17.....	1,300 00	
Taxes .....	" 17.....	273 00	
Rentals (freight cars, etc. ....	" 17.....	980 00	
		<hr/>	
		\$6,733 00	
Surplus distributed to owners—to balance .....		3,626 50	
		<hr/>	
			\$10,359 50

State of Ohio, county of Wood, ss.:

William A. Wiggins, General Manager of the Bowling Green Railroad, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

WM. A. WIGGINS,

[SEAL OF R. R.]

Gen'l Manager B. G. R. R.

Subscribed and sworn to before me, this 19th day of October, A. D. 1881.

D. W. H. DAY,

[SEAL.]

Notary Public, Wood county, Ohio.

# CELINA, VAN WERT AND STATE LINE EXTENSION C. AND N. W. RAILWAY.

*From June 30, 1880, to March 5, 1881.*

Principal office: Van Wert, O.

## CAPITAL STOCK.

Capital stock authorized by law:

Amount—common .....	\$100,000 00
Capital stock authorized by vote of company—common.....	\$100,000 00
Amount subscribed—common.....	10,650 00
Total paid in capital stock—common.....	10,650 00
Average amount paid in per mile of single main track (10.5 miles) .....	1,014 28
Proportion of same for Ohio: All.	
Stockholders, residents of Ohio.....	13
Amount of stock held by them June 30, 1881.....	10,650 00

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Am't actually issued.
1st mortgage .....	Road and equipm't .....	.....	.....	7%	\$40,000 00	\$23,000 00

Average amount per mile of single main track (10.5 miles)..... \$21,904 00

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate—per-

centage of income bonds....	\$40,000 00
Average amount per mile of single main track .....	3,809 50

Total of paid in stock and debt.....	\$73,650 00
Total average amount per mile.....	\$7,000 00

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.
Right of way .....	\$1,000 00
Civil engineering.....	500 00
Grading and masonry .....	5,000 00
Bridges .....	500 00
Timber and ties.....	5,000 00
Superstructure .....	23,675 00
Iron rails, chairs and spikes.....	25,000 00
Fencing .....	300 00
Engine and car houses .....	300 00
Machine shops, machinery and fixtures .....	525 00

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives .....	\$5,600 00
Second-class passenger cars .....	600 00
Box freight cars .....	1,300 00
Platform cars .....	700 00
Cost of road and equipment.....	70,000 00

## PROPOSED LINES.

From Columbus via Van Wert to State line, Michigan.....	80 miles.
Length graded, not laid with rail (South of Shane's Crossing, north of Van Wert) .....	20 "
Line operated under lease, embraced in this report—Length.....	10.375
Sidings and other tracks.....	.125
Total.....	10.5

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 1; greatest age, 2 years; length, 50 feet.

Trestles—Length of longest span, 15 feet.

Greatest space between cross ties upon bridges and trestles, 15 inches;  
length of ties, 6 feet 6 inches.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

Kind of fencing, as follows:

Post and board, about 10 miles.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality? Toledo,  
Delphos & Burlington, at Enterprise.

Do all trains stop at R. R. crossings as required by law? Yes.

## ROLLING STOCK.

Locomotives.....	1	Owned by C. & W. & S. L. E. C. N. W. R. R.
Passenger cars.....	1	" " " "
Freight cars.....	6	" " " "

Terms of service: 1.6.

Kind of brake: Ordinary.

Method of bridging between passenger cars, when two or more are run in trains:  
Board connections.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Coal.

Means of lighting same: Candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops: 13 miles per hour.

Mail and accommodation " " " "

## EMPLOYEES.

Engineers.....	1
Flagmen, switch-tenders and watchmen .....	1
Firemen .....	1
Brakemen.....	1
Section men.....	10

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American Express Co.

Terms: 10 cents per 100 lbs.—7½ miles.

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—	Highest.	Lowest
For distances less than 8 miles .....	3½ Cts.	2 Cts.
For distances over 8 miles—First class.....	3	2

## FREIGHT.

Rate per ton per mile on freight carried less than 30 miles:

	Highest.	Lowest.
First class.....	20 Cts.	16.5 Cts.

EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30,  
1880, TO MARCH 5, 1881.

## EARNINGS.

Passenger transportation—local .....	\$3,080 36	
Freight transportation—local.....	3,349 88	
		<hr/>
Total earnings of line operated included in this report.....		\$6,430 24

## OPERATING EXPENSES.

Conducting transportation .....	\$5,763 74	
General expenses:		
Taxes in Ohio.....	216 00	
		<hr/>
Total operating expenses.....		\$5,979 74

# CENTRAL OHIO RAILROAD COMPANY.

Name of company: Central Ohio Railroad Co., as re-organized.  
 By whom operated: Baltimore and Ohio Railroad Company.  
 By what authority: Lease.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

Given in previous reports.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
H. J. Jewett.....	President .....	New York City .....	.....
Wm. H. Ijams.....	Secretary .....	Baltimore .....	.....
Daniel Applegate .....	Treasurer .....	Zanesville, Ohio.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
H. J. Jewett.....	New York .....	Jos. W. Jenkins .....	Baltimore.....
Jos. R. Swan .....	Columbus, O.....	Joshua G. Harvey .....	" .....
Wm. Dennison.....	" .....	Wm. M. Clement .....	Morrow, O.....
Walter B. Brook .....	Baltimore.....	Robt. Garrett.....	Baltimore.....
Isaac W. Hall .....	Quaker City, O..	Osman Latrobe .....	" .....
Daniel Applegate.....	Zanesville, O.....	David Lee.....	Zanesville, O.....
Jno. King, jun .....	Cincinnati, O.....		

## CAPITAL STOCK.

### CAPITAL STOCK AUTHORIZED BY LAW.

Par value of each—common, \$50.00 per share..... \$3,000,000 00  
 preferred \$50.00 per share.....

### CAPITAL STOCK ISSUED TO DATE.

Amount—common, 48,946 shares ..... \$2,447,300 00  
 preferred, 8,283 ..... 411,550 00  
\$2,858,850 00

## Amount issued under new organization—

common..... 48,946 shares.

preferred..... 8,231 "

Total paid in capital stock—common..... \$2,447,300 00

preferred..... 411,550 00

Total..... \$2,858,850 00

Average amount paid in per mile of single main track (137.29 miles)... \$20,823 45

Proportion of same for Ohio (All).....

Stockholders, residents of Ohio, 295.

Amount of stock held by them June 30, 1881..... \$290,350 00

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage	By mortgage of the property of C. O. R. R. Co., under deed of trust, to the President of B. & O. R. R. Co., Western Bank of Baltimore, and the Central Ohio Road; and further, by a sinking fund of \$16,000, per amount paid by Central Ohio Road to said Trustees in semi-annual installments of \$8,000 each.	Date of mortgage, August 17, 1863.  Date of issue, Sept. 1, 1863.	Sept. 1, 1890	6 per cent. per annum.	\$2,500,000	\$2,498,000  On hand, 2,000
Total.....						\$2,500,000

Average amount per mile of single main track..... \$18,209 63

Amount in hands of Trustees of Sinking Fund for redemption..... \$509,385 53

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Bellaire, O., to Columbus, O.....	137.29	All.
Aggregate of sidings and other tracks .....	37.83	All.
Total length laid with rail computed as single track .....	175.12	All.
Laid with steel rail.....	137.29	
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Belmont .....	31.82	7.60	39.42
Noble.....	.45		.45
Guernsey .....	28.55	3.96	32.51
Muskingum .....	32.70	6.85	39.55
Licking .....	31.60	12.05	43.65
Franklin.....	12.17	7.37	19.54
Totals .....	137.29	37.83	175.12
Steel rail.....	137.29		137.29



## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 8 $\frac{1}{2}$ in.
Grade—Maximum, per mile.....	85.9 feet.
Longest maximum.....	15,840 "
Aggregate length of maximum .....	15,840 "
Curvature—Shortest radius .....	1938 "
Aggregate length of shortest radius .....	2,804 "
Aggregate length of all radii .....	90,657 "
Aggregate length of tangent.....	120.12 miles.
Rail—Steel—On road .....	137.29 "
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	3,000
Number laid during the year.....	95,644
Ballasted—On whole line .....	13,729 miles.
In Ohio .....	All.
With gravel 72.29; stone, 63.42; slag and cinder .....	1.58 "

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	49; greatest age....	20 years; aggregate length, ft..	4,129
Iron .....	12; " "	29 " "	1,571
<hr/>			
Total.....			5,700
Trestles—5; greatest age, 5 years; greatest height, 18 ft.; greatest length, 195 ft.; aggregate length, 418 ft.			
Length of shortest span of truss, 21 ft.; of longest, 149 ft.; greatest length of beams between points of support, if not trussed, 15 ft.			
Greatest space between cross ties upon bridges and trestles, 8 inches.			
Number of track stringers, one and two in bridges; three in trestles, under each rail.			
Are all bridges and trestles provided with guard rails? Partially.			
Do all bridges and trestles receive stated examinations? Yes.			
How often? Daily by trackmen, monthly by Superintendent of bridges.			
Are the examinations analytical, and are they made by a competent person? Yes.			
Tunnels—Stone.....	3; aggregate length, ft.....		1,196
Wood .....	2; " "		757
<hr/>			
Total .....			1,953
<hr/>			
Fencing—Average and Aggregate Cost.		Whole Line.	In Ohio.
Number miles fencing, computed as single line.....		265	All.
Kind of fencing, as follows:			
Post and board (average cost per rod, \$1.10) .....		184	All.
Rail (average cost per rod, 90 cents) .....		80	All.
Wire (average cost per rod, \$1.10) .....		1	All.
Average cost of fencing, \$1.10 per rod.			

Average cost of same per rod, \$1.10.

Length of road unfenced, and the reason thereof, 9.58 miles through towns and along streams, where fences are not required.

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Cleveland and Marietta Railroad at Cambridge.

Cincinnati and Muskingum Valley Railroad at Zanesville.

Sandusky, Mansfield and Newark Railroad at Newark.

P., C. & St. L. R'y at Newark.

Ohio Central Railroad at Granville.

Number of crossings of highways at grade in this State without protection, 105.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 1.

Number of crossings of highways over railroad, 15.

Number of highway bridges 18 feet above track, 15.

Do all trains stop at railroad crossings as required by law? Yes.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated, 137.29; in Ohio, all.

Miles of same owned by railroad company, 137.29; in Ohio, all.

##### STATIONS.

Passenger and freight, 40; in Ohio, all.

Number with telegraph communication, 17; in Ohio, all.

Number of same operated by railroad company, 17; in Ohio, all.

#### ROLLING STOCK.

Number of locomotives equipped with train brakes: .....

Kind of brake: Loughridge air brake.

Number of cars equipped with train brakes: All passenger, baggage, express and mail cars.

Kind: Loughridge air brake.

Method of bridging between passenger cars, when two or more are run in trains:

Movable Janney coupler upon bridge secured by chain.

State methods of heating cars used for the transportation of passengers: Baker's patent heaters and wood stoves, with doors locked.

Means of lighting same: Mineral sperm oil and candles.

##### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	33 miles per hour.
Mail and accommodation, .....	23 "
Freight trains, .....	12 "

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: B. & O. R. R. runs its own express.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.	Average life in years.	Equipment and superstructure.	Average life in years.
Rails—Steel, not used long enough to determine.		Ties—Oak.....	6
Joint fastenings—Not used long enough to determine.		Bridges—Wooden.....	20
Frogs.....	3	Trestles, 5 to 7 years.	
		Telegraph poles—Cedar.....	8
		Fence posts.....	8

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length—feet.
Clay Lick, No. 7.....	Pratt truss.....	Iron .....	100
Gibson's, No. 24 .....	Pratt truss.....	Iron .....	75.5
Franklin, No. 37 .....	Pratt truss.....	Iron .....	95
Self's Run.....	Trussed girder.....	Wood and iron.....	26

Trestles built in Ohio, replaced with iron, aggregate length, 190 feet.

Fencing in Ohio—Miles of single fence rebuilt, (average cost per rod, \$1.10) 2.32.

Ballasting—Miles of main track reballasted, with gravel, 22.68; stone, 18.90; cinder, 45.

Rail laid—Steel, 60 pounds per yard, miles of track, 33.10.

Train mileage—Passenger .....	391,086
Freight .....	492,290

Total.....	883,376
Car mileage—Passenger .....	1,010,092
Express and baggage .....	594,808
Freight—loaded .....	8,462,971
empty .....	2,453,381

Total.....	12,521,252
Fuel consumed—Wood, 989 cords; coal, 58,460 tons; total cost .....	\$66,341 22
Losses, etc., paid—For animals killed in Ohio: 6 cattle .....	113 00

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Income on sinking fund investment.....	\$29,306 50
--	-------------

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$150,000 00
Dividends, rate $6\frac{1}{2}$ per cent. on general stock.....	159,074 50
Last dividend declared on general stock, December 30, 1880.	
Dividends, rate 6 per cent. on preferred stock.....	24,693 00
Last dividend declared on preferred stock, December 30, 1880.	

CONDENSED GENERAL BALANCE SHEET, FOR FISCAL YEAR ENDING  
NOVEMBER 30, 1880.

## LIABILITIES.

Capital stock .....	\$3,000,000 00
Mortgage bonds .....	2,500,000 00
Unpaid bills .....	300 61
Due to other roads.....	545 47
Due old organization.....	41,746 06
Profit and loss (or surplus) .....	490,037 81
Total.....	<u>\$6,032,629 95</u>

## ASSETS.

Construction and equipment.....	\$5,500,000 00
Columbus and Newark Division.....	2,511 12
Baltimore and Ohio Railroad Company, old account .....	7,504 62
Due from other roads .....	9,217 67
Due from individuals (in litigation).....	5,448 20
Trustees of Sinking Fund .....	496,334 28
Baltimore and Ohio R. R. Company, on account contract..	9,536 25
Western National Bank of Baltimore .....	85 25
Bills receivable .....	1,992 56
Total.....	<u>\$6,032,629 95</u>
For this sum the Trustees of Sinking Fund hold 454 bonds of the company.....	\$454,000 00
16 bonds of the Pittsburgh and Connellsville Road .....	16,000 00
6 bonds of the Orange, Alexandria and Manassa Road.....	6,000 00
8 bonds of the Orange, Alexandria and Manassa Road of \$500 .....	4,000 00
336 shares Central Ohio Preferred Stock—cost.....	16,806 50
And uninvested .....	12,579 03
Value of sinking fund December 1, 1880.....	<u>\$509,385 53</u>

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
August 2, 1880	Unknown .....	Citizen .....	Lying on track, struck by engine .....	Dead when struck.
25, 1880	Wm. Wilson .....	Laborer .....	Lying on track, intoxicated .....	Killed.
Sept. 12, 1880	J. F. Beckern .....	Fireman .....	Thrown from train by brake wheel coming off.	Leg injured.
13, 1880	Colvin Beck .....	Boy .....	Getting on moving train .....	Killed.
Oct. 2, 1880	Jas. Cordell .....	Brakeman .....	Coupling .....	Hand injured.
27, 1880	Chas. Thompson .....	" .....	Fell from train .....	Collar bone brok'n and hip injur'd.
Nov. 9, 1880	Jas. Marshall .....	Citizen .....	Struck by train while crossing bridge .....	Killed.
10, 1880	Wm. Dement .....	Boy .....	Getting on moving train .....	"
20, 1880	Wm. Armstrong .....	Engineer .....	Collision .....	Foot amputated.
	Marion Bailey .....	Brakeman .....	" .....	Killed.
	Alvin Griffith .....	Fireman .....	" .....	Slightly injured.
	R. S. Bryant .....	Passeenger .....	" .....	"
	Mattie Roach .....	" .....	" .....	"
30, 1880	Jno. Wylie .....	Engineer .....	Driving across track .....	Killed.
27, 1880	Jno. Squibbs .....	Citizen .....	Collision .....	Leg and thigh broken.
Dec. 4, 1880	Jno. McConoughy .....	Brakeman .....	Getting on train in motion .....	Killed (off duty).
7, 1880	Jas. McGraw .....	Fireman .....	Coupling .....	Hand injured.
Jan'y 21, 1881	Andrew Hyatt .....	Brakeman .....	" .....	"
21, 1881	Wm. Lemay .....	" .....	" .....	"
24, 1881	Jno. Powell .....	Engineer .....	" .....	Ear injured.
Feb'y 19, 1881	J. A. Floyd .....	Brakeman .....	" .....	Hands injured.
26, 1881	A. Hyatt .....	" .....	" .....	Hand injured.
March 1, 1881	Henry Miller .....	Fireman .....	Fell from engine .....	Slightly injured.
May 13, 1881	L. L. Site .....	Citizen .....	Walking on track, intoxicated .....	Killed.
June 1, 1881	Geo. Oatman .....	Brakeman .....	Fell from train .....	Arm amputated.
4, 1881	Daniel Owens .....	Citizen .....	Driving across track .....	Slightly bruised.
16, 1881	Watson Kerr .....	" .....	" .....	Killed.
Aug. 21, 1880	S. Emerson .....	Passeenger .....	Getting off train in motion .....	Head injured.
Jan'y 6, 1881	Wm. Huffman .....	Brakeman .....	Fell in running to open switch .....	Cut knee cap.
17, 1881	A. Frizzell .....	Citizen .....	Getting on train in motion .....	One arm cut off.
Feb'y 3, 1881	E. Kennedy .....	Fireman .....	Flue burst .....	Scalded back and hips.
March 19, 1881	Jno. Doyle, Jr. ....	Conductor .....	Coupling .....	Hand injured.

## TRAIN ACCIDENTS.

Date.	Place.	Character of train.	Cause.	Effect.
1880.				
July				
10	Zanesville .....	Freight train .....	Collision in switching; carelessness.....	1 engine damaged.
10	Columbus .....	" .....	Collision in switching; carelessness.....	1 engine damaged.
23	Belmont.....	" .....	Collision (rear).....	12 cars damaged.
30	Zanesville .....	" .....	Collision in switching; carelessness.....	1 engine damaged.
September 24	Bellaire .....	" .....	Broken axle .....	5 cars damaged.
October				
4	Gibson's.....	" .....	Broken rail ... ..	2 cars damaged.
November 12	Claypoole .....	" .....	Collision (rear).....	1 engine and 4 cars damaged.
17	Concord.....	" .....	Draw-head pulled out.....	8 cars damaged.
20	Belmont.....	Fr'ght & pass'r tr'n.....	Collision—bumping.....	2 engines and 3 cars damaged.
30	Glencoe .....	Freight train .....	Collision—rear .....	1 engine and 2 cars damaged.
December				
4	Union.....	" .....	Collision—bumping with P., C. & St. L.....	1 engine and 11 cars damaged.
5	Burton's.....	" .....	Collision—rear .....	1 engine and 3 cars damaged.
1881.				
January				
6	Neff's .....	" .....	Collision—rear .....	4 cars damaged.
30	Pleasant Valley .....	" .....	Broken axle .....	1 car damaged.
February				
17	Bellaire .....	" .....	Collision—careless switching .....	1 engine and 5 cars damaged.
March				
2	Pleasant Valley .....	" .....	Jumped track (other causes) .....	1 car damaged.
April				
4	Bellaire .....	Passenger train .....	Loose switch .....	3 cars slightly damaged.
5	Pleasant Valley .....	Freight train .....	Broken rail .....	3 cars damaged.
May				
4	Belmont .....	" .....	Collision (rear) .....	1 car damaged.
June				
20	Claypoole .....	" .....	Collision—train broke in two .....	3 cars damaged.

## EMPLOYES.

General Manager.....	1
Master of Transportation.....	1
Master of road.....	1
Assistant Master of road .....	34
Master of Machinery.....	50
Baggagemen .....	12
Flagmen, switch-tenders and watchmen .....	59
Laborers .....	192
Clerks .....	35
Train dispatchers.....	2
Firemen .....	41
Wipers.....	13
Mechanics .....	235
Conductors.....	45
Brakemen.....	52
Station agents.....	31
Section men.....	253
Other employees .....	58
Total number employed by company in operating line .....	1,117
Proportion for Ohio .....	1,117

*State of New York, City and County of New York, ss.:*

Hugh J. Jewett, President of the Central Ohio Railroad Company, as reorganized, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed)

H. J. JEWETT, *President.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 7th day of October, A. D. 1881.

U. G. BARBER,

[SEAL.]

*Notary Public.*



# BALTIMORE AND OHIO RAILROAD COMPANY, OPERATING CENTRAL OHIO RAILROAD.

Name of road: Central Ohio Railroad, as reorganized.  
 By whom owned: Central Ohio Railroad Company.  
 By whom operated: Baltimore and Ohio Railroad Company.  
 By what authority: Lease.  
 Name of company making this report: Baltimore and Ohio Railroad Company.  
 General office at Baltimore, Md.  
 Principal office in Ohio at Newark, O.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. H. Ijams.....	Treasurer.....	Baltimore, Md.....	.....
W. T. Thelin .....	Auditor .....	" .....	.....
J. L. Randolph .....	Chief Engineer.....	" .....	.....
C. K. Lord .....	General Passenger Agent..	" .....	.....
L. M. Cole.....	General Ticket Agent .....	" .....	.....

## CHARACTERISTICS, ETC.

### LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Bellaire to Columbus.....	137.29 miles.	137.29 miles.

Total single main track .....	137.29 miles.	137.29 miles.
Aggregate of sidings and other tracks.....	37.83 miles.	37.83 miles.

Total length laid with rail computed as single track...	175.12 miles.	175.12 miles.
Laid with steel rail.....	137.29 miles.	137.29 miles.
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Belmont.....	31.82	7.60	39.42
Noble .....	.45	.....	.45
Guernsey .....	28.55	3.96	32.51
Muskingum .....	32.70	6.85	39.55
Licking .....	31.60	12.05	43.65
Franklin .....	12.17	7.37	19.54
Totals.....	137.29	37.83	175.12
Steel rail .....	137.29	.....	137.29

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet, 8 $\frac{1}{4}$ inches.
Grade—Maximum, per mile.....	85.9 feet.
Longest maximum.....	15,840 "
Aggregate length of maximum.....	15,840 "
Curvature—Shortest radius.....	938 "
Aggregate length of shortest radius .....	2,804 "
Aggregate length of all radii.....	90,657 "
Aggregate length of tangent.....	120.12 miles.
Rail—Steel—On road.....	137.29 "
Average weight per yard .....	60 lbs.
Ties—Average number per mile .....	3,000
Number laid during the year.....	95,644
Ballasted—On whole line .....	137.29 miles.
In Ohio.....	137.29 "
With gravel, 72.29 mi.; stone, 63.42 mi.; slag or cinder, 1.58 mi.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	49;	greatest age..	20 years;	aggregate length, ft..	4,129
Iron,	12;	"	29 "	"	1,571
Total .....					5,700
Trestles—5; greatest age, 5 years; greatest height, 18 ft.; greatest length, 195 ft.; aggregate length, 418 ft.					
Length of shortest span of truss, 21 ft.; of longest, 149 ft.; greatest length of beams between points of support, if not trussed, 15 ft.					
Greatest space between cross ties upon bridges and trestles, 8 inches; length of ties, 9 feet.					
Number of track stringers: One and two in bridges; three in trestles, under each rail.					
Are all bridges and trestles provided with guard rails? Partially.					
Do all bridges and trestles receive stated examinations? Yes.					
How often? Daily by trackmen, monthly by superintendent of bridges.					
Are the examinations analytical, and are they made by a competent person? Yes.					
Tunnels—Stone, 3; aggregate length, ft., 1,196.					
Wood, 2;	"			757	
Total.....					1,953
Fencing—Average and Aggregate Cost.					
Number miles fencing, computed as single line.....				Whole Line.	In Ohio.
Kind of fencing, as follows:					
Post and board (average cost per rod, \$1.10).....				184	184
Rail (average cost per rod \$0.90) .....				80	80
Wire (average cost per rod, \$1.10) .....				1	1
Average cost of fencing, \$1.10 per rod.					

Average cost of same per rod, \$1.10.

Length of road unfenced, and the reason therefor: 9.58 miles through towns and along streams, where fence is not required.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Cleveland and Marietta R. R., at Cambridge. •  
Cincinnati and Muskingum Valley R. R., at Zanesville.  
Sandusky, Mansfield and Newark R. R., at Newark.  
Pittsburgh, Cincinnati and St. Louis R'y, at Newark.  
Ohio Central R. R., at Granville.

Number of crossings of highways at grade in this State without protection.....	105
“ “ “ “ at which there are gates or flagmen..	1
“ “ “ over railroad.....	15
Number of highway bridges 18 feet above track .....	15
Are flagmen stationed at each? Yes.	

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated.....	137.29; in Ohio, 137.29
Miles of same owned by railroad company .....	137.29; “ 137.29

## STATIONS.

Passenger and freight .....	40; in Ohio, 40
Number with telegraph communication .....	17; “ 17
Number of same operated by railroad company .....	17; “ 17

## ROLLING STOCK.

Furnished by B. & O. R. R. Co.

Locomotives .....	38; Average weight, lbs.....	122,032
Number of locomotives equipped with train brakes, 9.		

Kind of brake: Loughridge air brakes.

Number of cars equipped with train brakes: All passenger, baggage, express and mail cars.

Kind: Loughridge air brakes.

Number of passenger cars with “Miller Platform”: None; but nearly all with Janney coupler and platform.

Method of bridging between passenger cars, when two or more are run in trains:

Movable bridges secured by a chain, between such cars not equipped with Janney platform,

State methods of heating cars used for the transportation of passengers: Baker's patent heaters and wood stoves with doors locked.

Means of lighting same: Mineral sperm oil and candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	33 miles per hour.
Mail and accommodation, .....	23 "
Freight trains, .....	12 "

## EMPLOYES.

General manager .....	1
Master of transportation .....	1
Master of road .....	1
Asst. master of road .....	1
Master of machinery.....	1
Telegraph operators .....	34
Engineers.....	50
Baggagemen .....	12
Flagmen, switch-tenders and watchmen .....	59
Laborers .....	192
Clerks .....	35
Train dispatchers.....	2
Firemen .....	41
Wipers.....	13
Mechanics .....	235
Conductors.....	45
Brakemen.....	52
Station agents .....	31
Section men.....	253
Other employees .....	58

Total number employed by company in operating line.....	1117
Proportion for Ohio.....	1117

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: B. & O. R. R. runs its own express.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.	Average life in Years.	Equipment and superstructure.	Average life in Years.
Rails—Steel. Not used long enough to determine.	3	Ties—Oak .....	6
Joint fastenings. Not used long enough to determine.		Bridges } Wooden .....	20
Frogs .....		} Trestles.....	5 to 7
		Telegraph poles—Cedar.....	8
		Fence posts .....	8

## DOINGS OF THE YEAR ENDING JUNE 30.

Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length—feet.
Clay Lick No. 7.....	Pratt truss.....	Iron .....	100
Gibson's 24.....	" .....	" .....	75 5 in.
Franklin 37.....	" .....	" .....	95
Self's Run .....	Trussell girder .....	Wood and iron .....	26

Trestles built in Ohio, replaced with iron, aggregate length, 190 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, \$1.10), \$2.32.

Ballasting—Miles of main track reballasted with gravel, 22.68; stone, 18.90; cinders, 45.

Rail laid—Steel, 60 lbs. per yard.

Train mileage—Passenger.....	391,086
Freight.....	492,290
Construction.....	Not kept separately.
Total.....	883,376
Car mileage—Passenger ....	1,010,092
Express, baggage and postal.....	594,808
Freight—loaded .....	8,462,971
empty.....	2,453,381
Construction and other .....	Not kept separately.
Total.....	12,521,252
Fuel consumed—Wood, 989 cords; coal, 58,460 tons; total cost .....	\$66,341 22
For animals killed in Ohio:	
Six cattle .....	113 00

## TRANSPORTATION.

Passengers—Number carried.....	320,401
Average number of miles traveled by each.....	49.06
Total mileage, or number carried one mile.....	15,718,873
Average amount received for each.....	91.5 cents.
Average amount <i>per mile</i> received for each.....	1.86 cents.
Freight—Tons carried, local.....	55,261
through .....	649,421
Total .....	704,682
Articles transported:	
	Tons. Per cent.
Coal .....	119,792 17.00
Stone, lime, sand, etc.....	15,636 2.22
Petroleum .....	1,212 .17

Ores .....	30,589	4.34
Pig and bloom iron.....	12,013	1.71
Manufactured iron .....	6,147	.87
Lumber and other forest products.....	44,661	6.34
Grain, flour, and other agricultural products .....	245,517	34.84
Live stock.....	23,078	3.27
Animal products .....	42,794	6.07
Manufactures, including agricultural implements.....	14,979	2.13
Merchandise .....	25,168	3.57
Miscellaneous ..	123,096	17.47
		<hr/>
Total tonnage yielding revenue.....	704,682	100

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation.....	\$293,127 43
Freight transportation .....	649,594 40
Mail service.....	28,323 08
Express service .....	47,399 25
<hr/>	
Total earnings of line operated included in this report.....	\$1,018,444 16

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$267,649 14	
Maintenance of cars .....	71,287 73	
Motive power .....	146,256 06	
Conducting transportation .....	261,224 85	
General expenses:		
Taxes in Ohio.....	\$26,692 56	
Other general expenses of operating.....	19,044 33	
	<hr/>	45,736 89
Total operating expenses, being 77.78 per cent. of earnings.....		\$792,154 67
Net earnings of 137 miles operated .....		226,289 49
Rentals paid (for use of road, track, depots, equipment), etc., 35 per cent. of \$1,018,444.16.....		356,455 46
Net income over operating expenses and rents paid, deficit .....		130,165 97

ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

CENTRAL OHIO RAILROAD.

629

	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880.				
2	August 25	Wm. Wilson.....	Laborer.....	Lying on track, intoxicated.....	Killed.
3	Sept. 2	J. T. Beckern.....	Fireman.....	Thrown from train by brake wheel coming off.....	Leg injured.
4	13	Colvin Bek.....	Boy.....	Getting on moving train.....	Killed.
5	Oct. 27	Jas Cordell.....	Brakeman.....	Coupling.....	Hand injured.
6	27	Chas. Thompson.....	".....	Fell from train.....	Collar bone brok'n and hip injur'd.
7	Nov. 9	Jas. Marshall.....	Citizen.....	Struck by train while walking across track.....	Killed.
8	10	Wm. Dement.....	Boy.....	Getting on train in motion.....	"
9	20	Wm. Armstrong.....	Engineer.....	Collision.....	Foot amputated.
10		Marion Bailey.....	Brakeman.....	".....	Killed.
11		Alvin Griffith.....	Fireman.....	".....	Slightly injured.
12		R. S. Buant.....	Passenger.....	".....	"
13		Mattie Roach.....	".....	Driving across track.....	Killed.
14	Nov. 27	Jno. Squibbs.....	Citizen.....	Collision.....	Slightly injured.
15	30	Jno. Wylie.....	Engineer.....	".....	Leg and thigh broken.
16	Dec. 4	Jno. McConoughey.....	Brakeman.....	Getting off train in motion (off duty).....	Killed.
17	7	Jas. McGraw.....	Fireman.....		
18	1881.				
19	Jan'y 6	Wm. Huffman.....	Brakeman.....	Running to open switch, fell down.....	Cut knee cap.
20	17	A. Frizzell.....	Citizen.....	Getting on train in motion.....	One arm cut off.
21	21	Andrew Hyatt.....	Brakeman.....	Coupling.....	Hand injured.
22	21	Wm. Lemay.....	".....	".....	"
23	Feb'y 3	E. Kennedy.....	Fireman.....	Flue bursted.....	Scalded back and hips.
24	19	Jas. A. Floyd.....	Brakeman.....	Coupling.....	Hand injured.
25	March 1	Henry Miller.....	Fireman.....	Fell from engine.....	Slightly injured.
26	19	Jno. Doyle, Jr.....	Conductor.....	Coupling.....	Hand injured.
27	May 13	L. L. Sites.....	Citizen.....	Walking on track, intoxicated.....	Killed.
28	June 1	Geo. Oatman.....	Brakeman.....	Fell from train.....	Arm amputated.
29	4	Daniel Owens.....	Citizen.....	Driving across track.....	Slightly injured.
	16	Watson Kerr.....	".....	".....	Killed.
	August 21	S. Emmerson.....	Passenger.....	Getting off train in motion.....	Head injured.



## SUMMARY OF ACCIDENTS.

Persons killed—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....		1	2	3
Collisions, and standing on platform of car during same...		1		1
Riding or driving across track .....			2	2
Lying, walking, falling, or being on track.....		1	2	3
Totals.....		3	6	9

Persons injured—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....	1		1	2
Driving or riding across track.....			1	1
Coupling, or caught between cars and engine .....		5		5
Falling or thrown from engine or train.....		4		4
Collisions .....	2	4		6
Broken axles and exploded or capsized engine .....		1		1
Miscellaneous .....		1		1
Totals.....	3	15	2	20

## RECAPITULATION.

Killed—Employees—from causes beyond their control .....	1	
misconduct or want of caution.....	2	
		3
Others—At stations and highway crossings .....	2	
Stealing rides.....	2	
Trespassing, on track, etc.....	2	
		6
Total killed .....		9
Injured—Passengers—from causes beyond their control.....	2	
misconduct or want of caution.....	1	
		3
Employees—from causes beyond their control.....	5	
misconduct or want of caution.....	10	
		15
Others—At stations and highway crossings.....	1	
Stealing rides.....	1	
		2
Total injured.....		20

## TRAIN ACCIDENTS—ENTIRE LINE.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1880.				
1 July 10	Zanesville ..	Freight.....	Collision in switching; carelessness in side-tracking.....	1 engine damaged.
2 10	Columbus .....	" .....	Collision in switching; carelessness in side-tracking.....	1 engine damaged.
3 23	Belmont.....	" .....	Collision—rear.....	1 engine, 1 caboose, 10 box cars, damaged.
4 30	Zanesville .....	" .....	Collision in switching; carelessness in side-tracking.....	1 engine damaged.
5 Sept. 24	Bellaire .....	" .....	Broken axle.....	5 box cars damaged.
6 Oct. 4	Gibson's .....	" .....	Broken rail.....	1 box car, 1 gondola, damaged.
7 Nov. 12	Claypool's .....	" .....	Collision—rear .....	1 engine, 1 caboose, 3 box cars, damaged.
8 17	Concord .....	" .....	Draw-head pulled out, throwing cars from track.....	8 box cars damaged.
9 20	Belmont.....	Fr't and pass'gr.	Collision—bumping .....	2 engines, 3 passenger cars, damaged.
10 30	Glencoe.....	Freight .....	Collision—rear .....	1 engine, 1 caboose, 1 box car, damaged.
11 Dec. 4	Union .....	" .....	Collision—bumping P. C. & St. L .....	1 engine, 8 gondolas, 3 flats, damaged.
12 5	Burton's.....	" .....	Collision—rear .....	1 engine, 3 box cars, damaged.
1881.				
13 Jan'y 6	Neff's.....	" .....	Collision—rear .....	1 caboose, 3 box cars, damaged.
14 30	Pleasant Valley.	" .....	Broken axle.....	1 box car damaged.
15 Feb. 17	Bellaire.....	" .....	Collision in switching; carelessness in side-tracking.....	1 engine, 1 gondola, 2 dumps, 1 stock car, damaged.
16 March 2	Pleasant Valley.	" .....	Jumped track (other causes).....	1 box car damaged.
17 April 4	Bellaire.....	Passenger .....	Loose switch.....	3 passenger cars slightly damaged.
18 5	Pleasant Valley	Freight.....	Broken guard-rail .....	3 box cars damaged.
19 May 4	Belmont .....	" .....	Collision—rear .....	1 box car, 1 caboose, damaged.
20 June 20	Claypool's .....	" .....	Train broken in two—collision.	1 box car, 1 gondola, 1 flat, damaged.

SUMMARY OF TRAIN ACCIDENTS.

Number:	
Accidents causing derailment of trains .....	6
Collisions—butting .....	3
Rear .....	11
<hr/>	
Total accidents.....	20
Causes of accidents effecting derailment of trains:	
Broken axle.....	2
Broken drawhead .....	1
Broken rail.....	1
Loose switch.....	1
Other causes .....	1
<hr/>	
Total.....	6
Causes of collisions:	
Carelessness in side-tracking .....	4
Misplaced switch .....	1
Running carelessly .....	4
Train breaking in two .....	1
Other causes .....	4
<hr/>	
Total.....	14
Total derailments.....	6
Total collisions.....	14
<hr/>	
Total accidents .....	20

State of Ohio, County of Licking, ss.:

B. Dunham, General Manager of the Central Ohio Railroad, operated by the Baltimore and Ohio Railroad Co., being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

B. DUNHAM,  
General Manager.

Subscribed and sworn to before me, this 8th day of November, A. D. 1881.

[SEAL.]

EDWARD KIBLER,  
Notary Public, Licking County, Ohio.

## CHAGRIN FALLS AND SOUTHERN RAILROAD COMPANY.

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Name of road: Chagrin Falls and Southern Railroad.

By whom owned: Chagrin Falls and Southern Railroad Company.

By whom operated: Chagrin Falls and Southern Railroad Company.

By what authority: Charter.

Name of person making this report: J. W. Williams, Gen'l Sup't of the Chagrin Falls and Southern Railroad Company.

General office at Chagrin Falls.

Principal office in Ohio at Chagrin Falls.

Address correspondence relating to this report to J. W. Williams, General Superintendent, at Chagrin Falls, Cuyahoga county, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

A portion of this line of road formerly belonged to the Painesville, Canton and Bridgeport Narrow Gauge Railroad Company, which had its origin under an act to provide for the creation and regulation of incorporated companies, passed May 1, 1852, with A. Wadden, H. Berdlar, Stanton Weaver and Daniel Eckley as corporators. Certificate of incorporation was duly certified to by Wm. Bell, Jr., Secretary State, on the 12th day of January, 1875. A portion of said line of road was constructed from Chagrin Falls to Solon, Ohio. When the company became so hopelessly embarrassed, the contractors that built that portion between Chagrin Falls and Solon, refused to deliver the road to the company until the conditions of their contract were complied with. The company being unable to pay the contractors, and for various parcels of lands for rights of way, suit was commenced by one Geo. Gee. A referee was appointed by the Common Pleas Court of Cuyahoga county, and later the Court rendered judgments for plaintiffs, under the report of the referee—the failure of the railroad company to meet said judgment and interest on the 1st mortgage bonds.

The creditors asked that a receiver be appointed to take charge of the road and assets of the company, and sell the same. The Court appointed J. H. Rhodes receiver, August 13, 1880. The said Court of Common Pleas issued an order of sale on judgment and decree, which sale took place September 28, 1880.

Said Painesville, Canton and Bridgeport N. G. R. R. and franchises were purchased by I. W. Pope, John W. Williams and Wm. Hutchings,

as trustees for the judgment and bond holders. Whereupon the said Pope, Williams and Hutchings and others filed the necessary papers for incorporating the Chagrin Falls and Southern Railroad Company, obtaining a charter for said company from the Secretary of State, — day of October 1880, with I. W. Pope, Jno. W. Williams, Wm. Hutchings, O. F. Frazer, Alfred Adams, Jno. Buttard and E. M. Sheffield as coporators.

When the sale of the road was confirmed by the Court, the trustees, who purchased the road, authorized the receiver to transfer their purchase of the P. C. & B. N. G. R. R. and franchise to the Chagrin Falls and Southern R. R. Co., which was subsequently done, passing into said company's possession February 1, 1881, since which time the Chagrin Falls and Southern R. R. has had uninterrupted possession, and are improving said road by filling trestles, building culverts, etc., intending at no distant day to extend their road to the coal fields south.

#### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
I. W. Pope .....	President.....	Chagrin Falls, O.....	None.
A. B. Gardner.....	Vice President.....	" .....	"
A. C. Williams .....	Secretary.....	" .....	"
Jos. Stoneman.....	Treasurer .....	" .....	"
Wm. Hutchings .....	General Manager .....	" .....	Not fixed.
J. W. Williams .....	General Superintendent..	" .....	"

#### DIRECTORS.

Name.	Residence.	Name.	Residence.
I. W. Pope .....	Chagrin Falls ...	Alfred Adams.....	Chagrin Falls.
A. B. Gardner .....	" .....	O. F. Frazer.....	"
Wm. Hutchings .....	" .....	J. G. Coleman.....	"
A. C. Williams .....	" .....	Jno. Buttard .....	"

#### CAPITAL STOCK.

##### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$40,000 00
Number of shares—common .....	800
Par value of each—common .....	\$50

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common.....	\$27,050 00
Amount subscribed—common .....	27,050 00
Total paid in capital stock—common.....	27,050 00
Average amount paid in per mile of single main track (5 miles)...	\$5,410 00
Proportion of same for Ohio (5 miles) .....	270 50

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

Amount of common—For subscriptions in cash .....	\$9,200 00
For original construction .....	1,178 00
For purchase of lines .....	16,672 00
<b>Total</b> .....	<b>\$27,050 00</b>

Stockholders, residents of Ohio, 17.

Amount of stock held by them June 30, 1881 ..... \$27,050 00

Agents authorized to transfer stock: The secretary of the company of stock holders.

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures for the year ending June 30, 1881.
Right of way.....	\$85 00
Grading and masonry .....	1,049 15
Timber and ties .....	134 89
Iron rails, chairs and spikes.....	22 50
Fencing .....	313 19
<b>Total expenditures to July 1, 1881.....</b>	<b>\$1,604 73</b>

## ROAD ACQUIRED BY PURCHASE.

Original cost \$27,050, purchased for.....	\$27,050 00
Subsequent expenditures for construction .....	1,604 73
<b>Total expended for construction and purchase .....</b>	<b>\$28,654 73</b>
Average cost per mile of road owned by company (single main track, 5 miles).....	\$5,730 10
Proportion of same for Ohio (5 miles).....	\$28,654 73

## COST OF EQUIPMENT OWNED BY COMPANY.

1 second-class passenger car.. .....	\$400 00
1 box freight car .....	300 00
6 platform cars.....	1,340 00
<b>Total for road and equipment .....</b>	<b>\$2,040 00</b>

Total average amount per mile (of single main track, 5 miles) .....	408 00
Proportion of same for Ohio (5 miles).....	2,040 00
Total permanent investment .....	28,654 73
Proportion for Ohio (5 miles).....	28,654 73
Average per mile (of single main track, 5 miles).....	5,730 10

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Fairport, Lake county, via Chagrin Falls to Bridgeport, Belmont county, 130 miles.

Length graded, not laid with rail, about 5 miles—about 5 miles from Solon, southerly.

Proposed gauge, 36 inches.

## LINE IN OPERATION.

Total length single main track, Chagrin Falls to Solon, 5 miles.

Total length laid with rail computed as single track, 5 miles.

Length in Ohio, distributed as follows: Cuyahoga and Geauga counties, main track, 5 miles; should judge about  $\frac{3}{4}$  mile in Geauga.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge, 3 feet.

Have no engineer's report; no engineer in the employ of this company.

Rail—iron—On road, 5 miles.

Average weight per yard, 30 lbs.

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 1; greatest age, 4 years; length, 63 feet.

Stone arch, 1; greatest age, 26 years; length, 100 feet.—Total, 163.

Trestles—12; greatest age, 5 years; greatest height, 12 feet; greatest length, 190 feet; aggregate length, 734 feet.

Length of shortest span of truss, 12 feet; of longest, 12 feet.

Greatest space between cross ties upon bridges and trestles, 6 inches; length of ties, 6 feet.

Number of track-stringers, 2.

Are all bridges and trestles provided with guard rails? No.

Do all bridges and trestles receive stated examinations? Yes.

How often? 4 times per week.

Are the examinations analytical, and are they made by a competent person? By section boss or General Manager.

## FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line,  $3\frac{1}{2}\frac{2}{3}$ ; in Ohio,  $3\frac{1}{2}\frac{2}{3}$ .

Kind of fencing, as follows:



Post and board (average cost per rod, 85c.), \$935.00.

Wire (average cost per rod, 60c.), \$7.20.

Average cost of fencing, \$942.20.

Average cost of same per rod,  $84\frac{73}{100}$ c.

Length of road unfenced, and the reason therefor,  $3\frac{84}{100}$  miles; shortness of time.

#### CROSSINGS.

Number of crossings of highways at grade in this State] without protection, except cattle guards and posts of warning, 8.

Number of crossings of highways under railroad, 1.

#### STATIONS.

Passenger and freight, 2; in Ohio, 2.

#### ROLLING STOCK.

Locomotives .....	1; Weight, lbs.....	27,000
Passenger cars, 2d class.....	1	
Freight cars.....	7	

Above includes not owned by company reporting.

Locomotives .....	1; Owned by National Bank, Fayette Co., Pa.	
Passenger cars, 5th class .....	1; " Chagrin Falls & Southern R. R. Co.	
Freight cars .....	7; " " "	

State methods of heating cars used for the transportation of passengers: One common coal stove for burning soft coal.

Means of lighting same: Side lamps. Petroleum oil used.

#### SPEED OF TRAINS.

Mail and accommodation .....	10 miles per hour.
Freight trains.....	10 "

#### EMPLOYES.

General Manager.....	1
Superintendents.....	1
Engineers.....	1
Firemen .....	1
Conductors.....	1
Brakemen .....	1
Station agents .....	2
Section men.....	5
Other employes .....	1

Total number employed by company in operating line.....	14
Proportion for Ohio.....	14

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: U. S. Express Co.

Terms: 10 per cent. out of receipts, and 6 cents per 100 lbs. freight.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles .....	5 Cts.	2 to 3 Cts.	4.95 Cts.

## FREIGHT.

Rate per ton per mile on freight carried less than 30 miles :

	Highest.
First class .....	24 Cts.
Second class .....	20
Third class .....	14
Fourth class .....	10
Special class .....	9
Rate per ton per mile for—	
Coal—Carried 10 miles or more .....	9
Carried less than 10 miles .....	9
Pig iron—Carried 10 miles or more .....	9
Carried less than 10 miles .....	9
Undressed stone or lumber—Carried 10 miles or more .....	10
Carried less than 10 miles .....	10

Rate per 100 pounds for loading :

First class included in above rates.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Trestles built in Ohio, 12; aggregate length, 734 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, 84.73c.),  $31\frac{5}{8}$ .

Grading—Miles of main track graded, 5; in Ohio, 5.

Ballasting—Miles of main track re-ballasted with gravel, 5; in Ohio, 5.

Rail laid—New iron, 30 lbs. per yard—miles of track,  $5\frac{1}{2}$ ; in Ohio, 5.

Car mileage—Passenger.....	6,200
Freight—loaded and empty.....	5,530

Total .....	11,730
Fuel consumed—coal, $139\frac{1}{2}$ tons; total cost.....	\$459 36

## TRANSPORTATION.

Passengers—Number carried, local .....	256
through .....	4,276
Total.....	4,532

Average number carried in each car per trip.....	4.55
Average number of miles traveled by each.....	4.90
Total mileage, or number carried one mile.....	22,241
Average amount received for each.....	23.80 cts.
Average amount <i>per mile</i> received for each .....	4.95 cts.
Freight—Tons carried .....	4,487 $\frac{535}{2000}$
Average amount received for each ton.....	56.27 cts.
Average amount <i>per mile</i> received for each ton.....	11.26 cts.

**Articles transported:**

	Tons.	Per cent.
Coal.....	2,030 <sup>11900</sup> <sub>2000</sub>	.....
Pig and bloom iron.....	199	.....
Miscellaneous.....	2,257 <sup>1435</sup> <sub>2000</sub>	.....
Total tonnage yielding revenue .....	4,487 <sup>5335</sup> <sub>2000</sub>	100

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local .....	\$30 75
through.....	1,051 52
Total .....	\$1,082 27
Freight transportation .....	2,525 10
Mail service.....	52 50
Express service.....	54 16
Other sources (baggage) .....	7 65
Total earnings of line operated included in this report.....	\$3,721 68

OPERATING EXPENSES.

Total operating expenses, being 66.62 per cent. of earnings .....	2,479 13
Net earnings of 5 miles operated .....	\$1,242 55
Net income over operating expenses and rents paid .....	1,242 65
Percentage of same to capital stock and debt .....	3.1
Percentage of to total means applied to construction, etc.....	5.8
Per mile of earnings.....	\$744 33.6; proportion for Ohio (5 mi.).. All.
operating expenses... 495 82.6;      "      "      "      ..	All.
net earnings..... 248 51.0;      "      "      "      ..	All.

CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock paid in and issued .....	\$27,050 00	
Expended in construction .....	1,604 73	
	<u>          </u>	\$28,654 73

## ASSETS.

Construction, equipment, etc., including cost of road :

Construction .....	\$1,604 73	
Rolling stock .....	2,040 00	
Real estate.....	25,010 00	
		<hr/> \$28,654 73

*State of Ohio, County of Cuyahoga, ss.:*

J. W. Williams, General Superintendent of the Chagrin Falls and Southern Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

J. W. WILLIAMS,

[SEAL OF R. R.]

*General Sup't Chagrin Falls & Southern R. R. Co.*

Subscribed and sworn to before me this 17th day of September, A. D. 1881.

[SEAL.]

S. S. WREISINSON, *Notary Public.*

CHICAGO AND CANADA SOUTHERN RAILWAY COMPANY AND  
LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY  
COMPANY, OPERATING.

Name of road: Chicago and Canada Southern Railway.  
By whom owned and operated: Lake Shore and Michigan Southern Railway Co.  
By what authority: Stock ownership and special agreement.  
General office at Grand Central Depot, New York, N. Y.  
Principal office in Ohio at Cleveland.  
Address correspondence relating to this report to C. P. Leland, Auditor, Cleveland, Ohio.

HISTORY OF ORGANIZATION AND CONSTRUCTION.

March 31, 1869. Michigan Air Line R. R. Company organized in Illinois.

May 19, 1871. Chicago and Canada Southern Railway Company organized in Indiana.

March 20, 1871. Northwestern Ohio Railroad Company organized in Ohio.

1871.—South Eastern Michigan Railroad Company organized in Michigan.

Sept. 17, 1872. All consolidated under the name of The Chicago and Canada Southern Railway Company.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Augustus Schell .....	President .....	New York.....	
E. A. Wickes.....	Vice President.....	" .....	
C. F. Cox .....	Secretary .....	" .....	
C. Vanderbilt .....	Treasurer .....	" .....	
Augustus Schell.....	Chairman .....	" .....	
Wm. H. Vanderbilt.....	Executive Committee }	" .....	
C. Vanderbilt .....		" .....	
Samuel F. Barger.....		" .....	
John Newell .....		Chicago, Ill.....	

## DIRECTORS.

Name.	Residence.	Name.	Residence.
W. H. Vanderbilt .....	New York.....	Samuel F. Barger.....	New York.
C. Vanderbilt .....	" .....	Wm. L. Scott.....	Erie, Pa.
Augustus Schell.....	" .....	E. A. Wickes .....	New York.
Sidney Dillon .....	" .....	John Newell .....	Chicago, Ill.
E. D. Worcester.....	Albany, N. Y....		

## CAPITAL STOCK.

Capital stock authorized by law—Amount, common .....	\$10,000,000 00
Number of shares, common.. 100,000	
Par value of each, common.....	\$100 00
Capital stock authorized by vote of company—common .....	\$2,667,400 00
Amount subscribed, common .....	2,667,400 00
Total paid in capital stock, common .....	2,667,400 00
Average amount paid in per mile of single main track (67.6 miles).....	39,458 58
Proportion of same for Ohio (4.5 miles) .....	177,563 61
Capital stock issued, and on what account, as follows:	
For original construction, No. shares, 26,674; amount of common.	2,667,400 00
Stockholders, residents of Ohio .....	2
Amount of stock held by them June 30, 1881.....	\$15,200 00
Agents authorized to transfer stock: C. F. Cox, Grand Central Depot, New York.	
Number of shares transferred within the year at such agencies, 2,109.	

## FUNDED DEBT.

1. Kind of bond or oblig'tions.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....		April 1st, 1872.	April 1st, 1902.	7 %	.....	\$2,541,000
Total .....					.....	\$2,541,000

Average amount per mile of single main track (67.6 miles)...	\$38,106 51
Proportion of same for Ohio (4.5 miles).....	171,479 29

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$8,952 18
All other debts, current credit balances, etc., including unpaid coupons.....	1,428,401 40
Total unfunded debt....	1,436,453 58

Net unfunded debt.....	\$1,436,453.58
Average amount per mile of single main track (67.6 miles)	\$21,249 31
Proportion of same for Ohio (4.5 miles).....	95,621 89
Increase since June 30, 1880 .....	183,726 58
Total net debt liabilities.....	3,977,453 58
Average amount per mile of single main track (67.6 miles)	\$58,838 07
Proportion of same for Ohio (4.5 miles).....	264,771 32
Total of paid in stock and debt.....	6,644,853 58
Total average amount per mile (67.6 miles).....	\$98,296 65
Proportion of same for Ohio (4.5 miles).....	442,334 93

## COST OF ROAD EQUIPMENT, Etc.

Total expenditures for construction.....	\$5,176,557 58
--	----------------

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Chandle to Fayette.....	66.47 miles.	4.66 miles.
Total single main track.....	66.47 “	4.66 “
Aggregate of sidings and other tracks .....	4.01 “	.28 “
Total length laid with rail computed as single track...	70.48 miles.	4.94 miles.
Laid with steel rail, all tracks.....	39.93 “	
Length in Ohio, distributed as follows:		
Fulton county, main track, 4.66 ; sidings, etc., .28 ; total, 4.94.		

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Rail—Iron—On road.....	30.55 miles.
Weight per yard.....	45, 50, 56 and 60 lbs.
Steel—On road.....	39.93 miles.
Average weight per yard .....	60 and 65 lbs.
Ties—Average number per mile.....	2,800.
Number laid during the year.....	21,493.
Ballasted—On whole line .....	66.47 miles.
In Ohio .....	4.66 “
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	1; greatest age .....	3 years; length.....	60 ft.
Trestles—5; greatest age, 9 years; greatest height, 22 ft.; greatest length, 200 feet; aggregate length, 464 feet.			
Length of shortest span of truss, 60 ft.; of longest, 60 ft.; greatest length of beams between points of support, if not trussed, 14 ft.			



Greatest space between cross ties upon bridges and trestles, 14 inches;  
length of ties, 12 ft.  
Number of track stringers, 4.  
Are all bridges and trestles provided with guard rails? Yes.  
Do all bridges and trestles receive stated examinations? Yes.  
How often? Monthly.  
Are the examinations analytical, and are they made by a competent person? Yes.

Fencing—Average and aggregate cost.	Whole line.	In Ohio.
Number miles fencing, computed as a single line.....	132.94	9.32
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.05).....	132.94	9.32

Number of crossings of highways at grade in this State without protection, 98;  
in Ohio ..... 6  
Number of crossings of highways over railroad..... 2  
Number highway bridges 18 feet above track ..... 2  
Do all trains stop at railroad crossings as required by law? Yes.  
Are flagmen stationed at each? Yes.

STATIONS AND TELEGRAPH.

TELEGRAPH LINE.

Same as last year.

STATIONS.

Passenger and freight (number)..... 15; in Ohio, 1

ROLLING STOCK.

Locomotives ..... 2  
Passenger cars..... 1  
Freight cars ..... 31  
Other cars ..... 10  
Number of locomotives equipped with train brakes..... 1  
Kind of brake: Westinghouse.  
Number of cars equipped with train brakes ..... 1  
Kind: Westinghouse.  
Method of bridging between passenger cars, when two or more are run in trains:  
Miller platform.  
Are all cars run on this road heated and lighted as prescribed by law? Yes.  
State methods of heating cars used for the transportation of passengers: Baker &  
Smith's heaters; hot water pipes in passenger cars. Smoking and baggage cars  
strong stoves, generally the Winslow safety stove.

Means of lighting same: Candles in globes, and lamps burning kerosene of 300° fire test.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	30 miles per hour.
Mail and accommodation, " .....	22 "
Freight trains, " .....	12 "

## EMPLOYEES.

Included in L. S. & M. S.

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: United States.

Terms: \$1.05 per day for messenger; 25 cents per 100 lbs. for freight.

## DOINGS OF THE YEAR ENDING JUNE 30.

Fuel consumed—Wood, 126 $\frac{7}{8}$  cords. Total cost ..... \$285 46

## TRANSPORTATION.

Passengers—Number carried.....	43,168
Average number carried in each car per trip.....	19
Average number of miles traveled by each .....	12 $\frac{1}{2}$
Total mileage, or number carried one mile.....	545,763
Average amount received for each .....	34 $\frac{1}{2}$ cents.
Average amount <i>per mile</i> received for each.....	2.747 "
Freight—Tons carried, local.....	56,029
Average tons in each loaded car per trip.....	8 $\frac{1}{2}$
Average tons in each loaded car per mile.....	8 $\frac{1}{2}$
Total movement, or tons carried one mile.....	1,092,477
Average amount received for each ton.....	629 cents.
Average amount <i>per mile</i> received for each ton .....	3.217 "
Average cost per ton freight per mile.....	3.168 "
Average amount received for each ton local freight .....	629 "

## Articles transported :

	Tons.	Per cent.
Coal .....	380	7
Stone, lime, sand, etc.....	1,362	2.4
Lumber and other forest products.....	23,649	42.2
Grain, flour, and other agricultural products.....	11,545	20.6
Live stock.....	3,030	5.4
Animal products .....	822	1.5
Manufactures, including agricultural implements.....	2,040	3.6
Merchandise .....	1,801	3.2
Miscellaneous .....	11,400	20.4
Total tonnage yielding revenue .....	56,029	100
Supplies for company's use.....	1,412	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation.....	\$14,777 36
Freight transportation.....	35,248 96
Mail service.....	3,786 96
Express service .....	682 50
<hr/>	
Total earnings of line operated included in this report.....	\$54,495 78

## OPERATING EXPENSES.

Maintenance of way and structures....	\$22,618 73
Maintenance of cars .....	309 26
Motive power .....	206 05
Conducting transportation .....	21,717 67
General expenses:	
Taxes in Ohio (4½ miles).....	\$1,677 37
“ Michigan (66 miles).....	1,080 30
<hr/>	
Salaries .....	\$2,757 67
<hr/>	
	6,081 12
<hr/>	
	\$8,838 79
<hr/>	
Total operating expenses, being 98½ per cent. of earnings .....	\$53,690 50
Net earnings of 70.48 miles operated. ....	805 28
Net income over operating expenses and rents paid .....	805 28
Per mile of earnings, \$773; proportion for Ohio (4.66 miles).....	3,602 18
“ operating expenses, \$761 .....	3,546 26
“ net earnings, \$12.....	*55 92

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt .....	\$183,726 58
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds .....	\$177,870 00
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## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Capital stock.....	\$2,667,400 00
First mortgage bonds.....	2,541,000 00
Bills and accounts payable.....	13,817 33
Past due coupons .....	1,422,636 25
<hr/>	
	\$6,644,853 58

\* About 3½ per cent. of the taxes assessed in Ohio.

## ASSETS.

Construction .....		\$5,176,557 58	
Income account.....	\$45,659 75		
Interest on bonds .....	1,422,636 25		
		<hr/>	
		1,468,296 00	
		<hr/>	\$6,644,853 58

*State of New York, City and County of New York, ss.:*

Chas. F. Cox, Secretary of the Chicago and Canada Southern Railway Company being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

C. F. Cox, *Secretary.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 6th day of September, A. D. 1881.

[SEAL.]

DWIGHT W. PARDEE,

*Com'r for Ohio, residing in New York.*

NOTE.—This road is operated by the Lake Shore & Michigan Southern Railway Company (the principal bond and stock holder) as agent for the bond and stock holders.

All questions not answered here are included in the statistics in the L. S. & M. S. report.

The most essential questions, however, are answered in this report.

C. P. LELAND, *Auditor L. S. & M. S. R'y.*

## CINCINNATI AND BALTIMORE RAILWAY COMPANY.

Name of road: Cincinnati and Baltimore Railway.

By whom owned: Cincinnati and Baltimore Railway Company.

By whom operated: Receiver of Marietta and Cincinnati Railroad Company.

By what authority: Lease to Marietta and Cincinnati Railroad Company.

Name of company making this report: Cincinnati and Baltimore Railway Co.

General office at Cincinnati, Ohio.

Principal office in Ohio at Cincinnati, Ohio.

Address correspondence relating to this report to Charles F. Low, Secretary, at Cincinnati, Ohio.

### NAME, TITLE, AND ADDRESSES OF OFFICERS.

Name.	Office.	Address.	Salary.
W. T. McClintick .....	President .....	Cincinnati, O .....	\$1,000
Charles F. Low .....	Secretary .....	" .....	100
Wm. E. Jones .....	Treasurer and Registrar...	" .....	
Total salary .....			\$1,100

### DIRECTORS.

Name.	Residence.	Name.	Residence.
W. T. McClintick .....	Chillicothe, O...	W. W. Scarborough .....	Cincinnati, O.
John Waddle .....	" .....	W. W. Peabody .....	"
Robert Garrett .....	Baltimore, Md..	R. A. Holden .....	"
Jno. King, Jr. ....	Cincinnati, O...		

### CAPITAL STOCK.

#### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$1,250,000 00
Number of shares—common .....	25,000
Par value of each—common .....	\$50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$1,250,000 00	
Amount subscribed—common.....	1,250,000 00	
Total paid in capital stock—common .....	1,247,455 00	
Average amount paid in per mile of single main track (5.8 miles).....		\$215,078 45
Proportion of same for Ohio.....		All.

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

Amount of common—For subscriptions paid in cash.....	\$1,247,455 00
Stockholders, residents of Ohio .....	127
Amount of stock held by them June 30, 1881.. .....	\$611,050 00
Agents authorized to transfer stock: General office, Cincinnati, O.	
Number of shares transferred within the year at such agencies.....	1,924

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....	By mortgage.....	1870	1900	7%	\$500,000 00	\$500,000 00
Total .....					\$500,000 00	\$500,000 00

Average amount per mile of single main track, (5.8 miles)..... \$86,206 89  
Proportion of same for Ohio: All.

*State of Ohio, County of Hamilton, ss.:*

Wm. T. McClintick, President of the Cincinnati and Baltimore Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement, as far as the same purport to be made, of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

WILLIAM T. MCCLINTICK,

[SEAL OF R. R.]

President.

Subscribed and sworn to before me, this 27th day of October, A. D. 1881.

WILLIS H. WIGGINS,

[SEAL.]

Notary Public, Hamilton County.

## CINCINNATI AND EASTERN RAILWAY COMPANY.

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Name of road : Cincinnati and Eastern Railway.

By whom owned : Cincinnati and Eastern Railway Company.

By whom operated : Cincinnati and Eastern Railway Company.

By what authority : Charter.

Name of person, making this report : Wm. Mansfield, Secretary and Auditor C. & E. Railway Company.

General office at Batavia, Clermont Co., O.

Principal office in Ohio at Batavia, Clermont Co., O.

Address correspondence relating to this report to Wm. Mansfield, Secretary and Auditor, at Batavia, Clermont Co., O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Cincinnati, Batavia and Williamsburgh R. R. Co. was organized to build a railroad from Cincinnati, Ohio, to Williamsburgh, Ohio, (Clermont Co.), and was incorporated January 11, 1876. Capital stock authorized, was \$200,000. May 10, 1876, the capital stock was increased to \$500,000. May 16, 1876, eastern terminus changed from Williamsburgh, Ohio, to Portsmouth, Ohio. May 24, 1876, name of company changed to "Cincinnati and Eastern Railway Company". October 18, 1876, main line first operated between Baltimore Junction, Hamilton county, Ohio, and Batavia, Clermont county, Ohio, 15.4 miles.

December 12, 1876, charter amended and permission granted to construct a branch road from near Newton, Hamilton county, Ohio, to New Richmond, Ohio.

March 1, 1878, Ohio river branch of C. and E. R'y first operated between Richmond Junction and Tobasco, 5 miles. August, 1877, main line first operated between Batavia Junction, Hamilton county, Ohio, and Winchester, Adams county, Ohio, 47.5 miles. June 25, 1878, additional portion of main line first operated between Batavia Junction, Hamilton county, Ohio, and Miami Valley Junction (near Cincinnati), Hamilton county, Ohio, 5 miles.

March 1, 1880, additional Ohio river branch operated in all from Richmond Junction to New Richmond, 13.63 miles. November 1, 1880, this company began to operate the Columbus and Maysville Railway as part of its line under a temporary lease. No rent was to be paid. The termini of said railway are at Sardinia, Brown county, Ohio, and Hills-



boro, in Highland county, Ohio. The President of this latter named road is C. S. Bell, of Hillsboro, Ohio.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. R. McGill.....	President.....	Newton, O.....	\$2,000 00
Wm. Mansfield.....	Secretary.....	Batavia, O.....	900 00
M. Jamieson.....	Treasurer.....	".....	1,500 00
Wm. Mansfield.....	Auditor.....	".....	600 00
Chas. A. Mansfield.....	Asst. Auditor.....	".....	1,500 00
Geo. H. Wilber.....	General Superintendent...	".....	720 00
Geo. D. Little.....	General Freight Agent.....	".....	
Wm. Mansfield.....	General Ticket Agent.....	".....	
Total salaries.....			

## DIRECTORS.

Name.	Residence.	Name.	Residence.
W. R. McGill.....	Newton, O.....	O. H. Hardin.....	Williamsb'gh O.
J. P. Duckwall.....	Locust Cor., O...	Chas. H. Thomas.....	"
Geo. H. Wilber.....	Linwood, O.....	F. M. Smith.....	Mt. Oreb, O.
S. Woodward.....	Cincinnati, O....	Jas. Crissman.....	Winchester, O.
M. Jamieson.....	Batavia, O.....	N. R. Thomson.....	"
J. M. Neely.....	".....	Wm. Mansfield.....	Batavia, O.

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$500,000 00
Number of shares—common.....	10,000
Par value of each—common.....	50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount subscribed—common.....	\$298,527 89
Total paid in capital stock—common.....	242,427 46
Increase since June 30, 1880—common.....	439 71
Average amount paid in per mile of single main track (68 miles) .....	3,682 75
Capital stock issued, and on what account, as follows: For subscriptions paid in cash—Number of shares, 3,517; amount of common, \$175,850.	
Stockholders, residents of Ohio, 1,909.	
Amount of stock held by them June 30, 1881.....	\$242,427 46
Agents authorized to transfer stock: Wm. Mansfield, Secretary, Batavia, O.	
Number of shares transferred within the year at such agencies, 6.	

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage..	1st mortgage on Main Line.....	June 26, 1876..	July 1, 1896..	7%	\$500,000	\$304,600
2d mortgage..	2d mortgage on Main Line.....	July 1, 1880...	July 1, 1900..	7%	300,000	214,800
1st mortgage..	1st mortgage on O. R. Branch ..	July 22, 1878..	July 1, 1908..	7%	350,000	81,800
Total .....	.....	.....	.....	.....	\$1,150,000	\$601,200

Average amount per mile of single main track (68 miles)..... \$8,841 00

Increase since June 30, 1880..... 3,711 13

Amount in hands of Trustees of Sinking Fund for redemption: nothing.

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate..... \$32,911 64

All other debts, current credit balances, etc ..... 8,490 42

Total unfunded debt..... \$41,402 06

Cash securities, debit balances, etc., available to payment ... 28,812 12

Net unfunded debt ..... \$12,589 94

Average amount per mile of single main track ..... \$185 14

Decrease since June 30, 1880 ..... 258 26

Total net bebt liabilities..... \$613,789 94

Average amount per mile of single main track..... \$9,026 32

Total of paid in stock and debt ..... \$856,217 40

Total average amount per mile ..... \$12,591 43

## COST OF ROAD EQUIPMENT, Etc.

In A. D. 1879, when the receiver took charge of the road, it was found that there existed a large amount of construction debt, which had never been reported to the auditor, and had not been taken into the account. It was impossible to distribute this to the different sources of expense, and after an unsuccessful attempt to do so, it was charged to "construction and equipment" without having regard to the details.

For this reason I am unable to fill these items, and merely give the total charged "cost of road and equipment," and "construction."

W. M.

Total expenditures for construction.....	\$841,885 48
Total for road and equipment .....	841,885 48
Total average amount per mile (of single main track, 68 miles).....	12,380 66

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Miami Valley Junction via Winchester to Portsmouth, about 107 miles.

From Richmond Junction to Aberdeen, miles unknown.

Length graded, not laid with rail, 10 miles.

East of Winchester, Adams county.

Proposed gauge, 36 inches.

## LINE IN OPERATION.

Length of single main track, Miami Valley Junction to Winchester.....	53.5 miles.
“ “ Richmond Junction to New Richmond .....	14.5 “
“ “ Sardinia to Hillsboro .....	19.0 “
Total single main track.....	87.0 miles.
Aggregate of sidings and other tracks .....	2.31 “

Total length laid with rail computed as single track..... 89.31 miles.

Laid with steel rail: None.

Length in Ohio, distributed as follows:

County.	Main track.	Branches.	Sidings, etc.	Total.
Hamilton .....	10.8	3.03	.77	14.87
Clermont .....	20.98	11.47	.86	33.31
Brown .....	20.19	.....	.38	20.57
Adams .....	1.53	.....	.30	1.83
Highland .....	19.	.....	.....	.....
Total .....	72.5	14.5	2.31	89.31

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

Columbus and Maysville Railway, length, 19 miles.

Total single track, length, 19 miles.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Have been waiting to get this information, but our engineer is sick, and it cannot be finished. W. M.

Rail—Iron—On road..... 68 miles.

Average weight per yard..... 38.2 lbs.

Ties—Average number per mile .....	2,640
Ballasted—On whole line .....	30 miles.
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—28; greatest age, 5 years; aggregate length, 1,776 feet.
Trestles—80; greatest age, 5 years; greatest height, 50 feet; greatest length, 775 feet; aggregate length, 11,319 feet.
Length of shortest span of truss, 30 feet; of longest, 160 feet; greatest length of beams between points of support, if not trussed, 25 feet.
Greatest space between cross ties upon bridges and trestles, 12 inches; length of ties, 6 feet.
Number of track-stringers, 2.
Are all bridges and trestles provided with guard rails? Yes.
Do all bridges and trestles receive stated examinations? No.
How often? Under almost constant supervision.
Are the examinations analytical, and are they made by a competent person? Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line, whole line about 25.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?  
Little Miami Railroad at Batavia Junction.

What railroads cross your road either over or under your grade in this State, and where? None.

Number of crossings of highways at grade in this State without protection, 65.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated, in Ohio, 68.

Miles of same owned by railroad company: None.

## STATIONS.

Passenger and freight .....	50
Number with telegraph communication .....	10
Number of same operated by railroad company .....	10

## ROLLING STOCK.

Locomotives, 5; average weight .....	54,800 lbs.
Express and baggage, 2; average weight .....	16,000 "
Passenger cars, 7; average weight .....	18,000 "
Freight cars, 70; average weight .....	9,278 "

Above includes not owned by company reporting.

Locomotives, 1; owned by C. & M. Railway Company.

Passenger cars, 1; C. & M. Railway Company.

Freight cars, 10; C. & M. Railway Company.

Term of service: Engines were new in fall of 1876 and spring of 1877; cars been in service since 1876.

Number of locomotives equipped with train brakes, 4.

Kind of brake: Westinghouse Air.

Number of cars equipped with train brakes, 3 passenger, 1 baggage.

Number of passenger cars with "Miller Platform," 6.

Method of bridging between passenger cars, when two or more are run in trains: Miller Platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Iron stoves securely bolted together and to the floor, and which do not permit the escape of fire.

Means of lighting same: Lard oil and candles.

#### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	16 miles per hour.
Mail and accomodation .....	12 "
Freight trains .....	10 "

#### AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

The original equipment is still in use, also material in the road.

#### RATES OF TRANSPORTATION.

##### PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles.....	3c.	1½c.	*
For distances over 8 miles—1st class.	3c.	1½c.	
Excursions, 2c. per mile.			

##### FREIGHT.

We have no information on these matters.

W. M.

#### DOINGS OF THE YEAR ENDING JUNE 30TH.

Trestles built in Ohio, Ohio River Branch 1; aggregate length.....	640 feet.
Length filled and converted into embankment...	450 feet.
Train Mileage—Passenger .....	38,227
Freight .....	3,597
Mixed .....	56,923
Total.....	98,747

\* Cannot give this information.

Car Mileage—Passenger .....	93,891	
Express and baggage.....	70,056	
Freight—loaded.....	137,119	
empty.....	69,123	
Total .....		370,189
Fuel consumed—Coal, 1,651.10 tons. Total cost.....		\$5,867 16
Losses, etc., paid—For animals killed in Ohio:		
1 horse.....	\$65 35	
3 cattle .....	59 70	
6 hogs .....	18 58	
Total .....		\$143 63

## TRANSPORTATION.

Passengers—Number carried, local.....	85,109
Freight—Tons carried, local.....	26,001

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local.....	\$33,852 48
Freight transportation—local.....	35,039 63
Mail service.....	4,350 91
Express service .....	3,406 28
Other sources .....	222 71
Total earnings of line operated included in this report.....	\$76,872 01

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$15,559 74
Maintenance of cars .....	1,985 74
Motive power .....	19,569 84
Conducting transportation .....	13,727 71
General expenses:	
Taxes in Ohio.....	\$1,969 10
Salaries .....	6,353 52
Other general expenses of operating.....	2,228 86
	<u>\$10,551 48</u>
Total operating expenses, being 79 per cent. of earnings .....	\$61,394 51
Net earnings of 87 miles operated .....	15,477 50
Net income over operating expenses and rents paid.....	15,477 50
Percentage of same to capital stock and debt.....	1.9
Percentage of to total means applied to construction, etc.....	1.9
Per mile of earnings .....	\$883 58
Per mile of operating expenses.....	705 67
Per mile of net earnings.....	177 90

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock .....	\$439 71	
Sale of bonds of company, \$272,300, at par rates .....	249,278 35	
		<hr/> \$249,718 06

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds .....	\$37,197 50	
Bonds of company canceled.....	187,639 72	
Floating debt liquidated, and interest on same.		
Construction of new work.....	3,244 10	
Additional equipment .....	3,796 83	
		<hr/> \$231,878 15

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$277,953 41	
Funded debt.....	601,200 00	
Bills payable.....	15,566 72	
Accounts payable.....	7,627 87	
Income, notes and certificates.....	1,789 90	
Unsold bonds .....	5,500 00	
Other items.....	6,982 75	
Income account, C. & E. R'y .....	24,218 12	
Income account, Col. & M. R'y.....	458 54	
		<hr/> \$941,297 31

## ASSETS.

Cost of road and equipment .....	\$841,885 48	
Stock of Col. & M. R'y .....	1,000 00	
Cash with Treasurer.....	17,876 09	
Cash in transportation .....	2,836 73	
Cash with station agents and conductors .....	445 33	
Due from P. O. Department .....	1,142 22	
Due from other companies.....	962 37	
Collateral accounts .....	5,500 00	
Discount second mortgage bonds.....	7,911 65	
Other miscellaneous items .....	56,977 83	
Income account, O. R. Branch.....	4,759 61	
		<hr/> \$941,297 31



*State of Ohio, County of Clermont, ss.:*

W. R. McGill, President of the Cincinnati and Eastern Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

W. R. MCGILL,

*President.*

Subscribed and sworn to before me, this 1st day of September, A.D. 1881.

[SEAL.]

O. P. GRIFFITH,

*Notary Public in and for Clermont Co., O.*

CINCINNATI, GEORGETOWN AND PORTSMOUTH RAILROAD  
COMPANY.

September 13, 1880, to June 30, 1881.

Name of road : Cincinnati, Georgetown and Portsmouth Railroad.  
By whom owned : Cincinnati, Georgetown and Portsmouth Railroad Company.  
By whom operated : Same.  
By what authority : Charter.  
Name of company making this report : Cincinnati, Georgetown and Portsmouth Railroad Company.  
General office at Cincinnati.  
Address correspondence relating to this report to M. Simmons, Secretary, at 31½ West Third street, Cincinnati.

HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Cincinnati and Portsmouth Railroad was sold at judicial sale September 13, 1880, by order of the Court of Common Pleas, of Clermont county, Ohio, and was purchased by H. Brachmann, and operated by him until the present company, the Cincinnati, Georgetown and Portsmouth, was organized.

The Cincinnati, Georgetown and Portsmouth Railroad was incorporated December 23, 1880, and organized March 21, 1881.

List of officers, etc.—See page 4.

CAPITAL STOCK.

Capital stock authorized by law—Amount, common.....	\$500,000 00
Number of shares, common... 10,0000	
Par value of each, common.....	50 00
Capital stock authorized by vote of company—common .....	113,450 00
Amount subscribed, common	113,450 00
Average amount paid in per mile of single main track (28.6 miles).....	4,050 00
Capital stock issued, and on what account, as follows :	

On what account.	Amount of common.
For construction on extension of line or branches.....	\$20,111 15
For purchase of lines.....	83,333 00
Total.....	\$113,444 15

Stockholders, residents of Ohio.....	7
Amount of stock held by them June 30, 1881.....	\$113,450 00

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....	Mortgage.....	April 1, 1881..	April, 1901.....	6	\$500,000 00	\$240,000 00

None sold.

Average amount per mile of single main track (100 miles), \$2,400.

Proportion of same for Ohio, all.

## COST OF ROAD EQUIPMENT, Etc.

For expenditures prior to July 1, 1880, see report of Cincinnati & Portsmouth R. R.

Construction account.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1, 1881.
Right-of-way .....	.....	.....
Civil engineering .....	\$158 60	.....
Grading and masonry .....	722 26	.....
Timber and ties.....	543 25	.....
Superstructure .....	697 25	.....
Iron rails, chairs and spikes .....	27,869 08	.....
Contingent expenses.....	120 71	.....
Total expenditures for construction .....	.....	\$30,111 15

## ROAD ACQUIRED BY PURCHASE.

Cincinnati and Portsmouth (original cost \$262,550.43) purchased for.....	\$83,333 00
Subsequent expenditures for construction .....	30,111 15

Total expended for construction and purchase ..... \$113,444 15

Average cost per mile of road constructed (single main track 28.6 miles), total.

Average cost per mile of road owned by company (single main track.... miles), \$13,150.00.

Cost of road and equipment, etc.—See report of Cincinnati and Portsmouth R. R.

Mail and express cars.....	\$29,176 82
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## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Columbia via Georgetown to Portsmouth; 100 miles.

Length graded, not laid with rail, 8 miles; Bethel to east of Hamersville.

Proposed gauge, 36 inches.

## LINE OF OPERATION.

	Length.	In Ohio.
Single main track, Columbia to Bethel (completed to Bethel June 30, 1881 .....	28.6 miles.	28.6 miles.
Aggregate of sidings and other tracks .....	1.1 "	1.1 "
Total length laid with rail computed as single track .....	29.7 "	29.7 "
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Hamilton .....	10.4	.7	11.1
Clermont .....	18.2	.4	18.6
Total .....	28.6	1.1	28.6

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	3 feet.
Grade—Maximum, per mile.....	132 "
Longest maximum .....	1,500 "
Aggregate length of maximum .....	1,500 "
Curvature—Shortest radius .....	573 "
Aggregate length of shortest radius.....	1,000 "
Rail—Iron—On road .....	28.6 miles.
Average weight per yard.....	85 & 40 lbs.
Ballasted—On whole line .....	16 miles.
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Combination.....	1; greatest age.....	4 years; length.....	508.4 ft.
Trestles—32; greatest age, 4 years; greatest height, 51 feet; greatest length, 2,330 ft.			
Length of shortest span of truss, 30 feet; of longest, 51 feet.			
Greatest space between cross ties upon bridges and trestles, 12 inches; length of ties, 6 and 12 feet.			
Number of track stringers, 2 and 4.			
Are all bridges and trestles provided with guard rails? Yes.			
Do all bridges and trestles receive stated examinations? Yes.			
How often? Once a week.			
Are the examinations analytical, and are they made by a competent person? Yes.			

## CROSSINGS.

What railroads cross your road either over or under your grade in this State, and where? Under—New Richmond Branch of Cincinnati Eastern, at Dry Run.			
Number of crossings of highways at grade in this State without protection, 27.			
"        "        "        under railroad, 2.			

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? No.

### STATIONS AND TELEGRAPHS.

#### TELEGRAPH LINE.

Western Union—have two stations.

#### STATIONS.

Passenger and freight .....	17; in Ohio..	All.
Number with telegraph communication.....	2; " ...	All.
Number of same operated by railroad company.....	2; " ...	Jointly.

Is pay received for messages sent over line owned by railroad company? Not by R. R. Company.

### ROLLING STOCK.

Locomotives .....	2; Average weight.....	36,000 lbs.
Express and baggage cars.....	1; " .....	14,000 "
Passenger cars .....	3; " .....	16,000 "
Freight cars .....	21; " .....	8,800 "

Number of locomotives equipped with train brakes, 2.  
 Kind of brake: Westinghouse.  
 Number of cars equipped with train brakes, 4.  
 Kind: Westinghouse.  
 Number of passenger cars with "Miller Platform", 3.  
 Method of bridging between passenger cars, when two or more are run in trains:  
 Miller Platform.  
 Are all cars run on this road heated and lighted as prescribed by law? Yes.  
 State methods of heating cars used for the transportation of passengers: Coal stoves.  
 Means of lighting same: Candles.

#### SPEED OF TRAINS.

Express passenger, average rate, including stops .....	16 miles per hour.
Mail and accommodation .....	14 " "
Freight trains .....	12 " "

#### EMPLOYES.

Superintendents.....	1
Engineers.....	2
Baggagemen.....	1
Clerks.....	1
Firemen.....	2
Wipers.....	2
Mechanics.....	1
Conductors .....	2
Station Agents.....	11
Section men.....	23

---

Total number employed by Company in operating line..... 46

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives.....	Passenger.....	4	Rails—Iron.....		4
	Passenger.....	4	Joint Fastenings.....		4
	Baggage.....	4	Frogs.....		4
Cars.....	Box.....	4	Ties—Oak.....		4
	Flat.....	4	Bridges—Combination.....		4

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile:	Highest.	Lowest.	Average.
For distances less than 8 miles.....	4cts.	3cts.	3cts.
Over 8 miles—First class.....	3	3	3

Excursion, half rates and 2 cents per mile.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

First class.....	19	5
Second class.....	18	5
Third class.....	17	4
Fourth class.....	15	4
Special class.....	12	4

Rate per ton per mile on freight carried less than 30 miles:

First class.....	10	6	6½
Second class.....	10	6	
Fourth class.....	9	5	5½
Special class.....		5	5

Rate per ton per mile for—

Coal—Carried ten miles or more.....	4	4	4
Limestone—Carried ten miles or more.....	4	4	4
Undressed stone or lumber—Carried ten miles or more.....	4	4	4

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Trestles built in Ohio, 4; aggregate length, 1,400 feet.

Ballasting—Miles of track ballasted with gravel, 8; in Ohio, 8.

Rail laid—New iron, 40 lbs. per yard, 8.2; in Ohio, 8.2.

Train mileage—Passenger.....	20,800	
Mixed.....	10,400	
Construction.....	8,976	
Total.....		40,176
Car mileage—Passenger.....	45,213	
Express and baggage.....	1,440	
Total.....		46,653
Fuel consumed—Wood, 82 cords; coal, 504 tons. Total cost.....		\$1,250 00

TRANSPORTATION—SEPTEMBER 13<sup>TH</sup>, 1880, TO JUNE 30<sup>TH</sup>, 1881.

Passengers—Number carried, total.....	31,553
Average number of miles traveled by each.....	11
Average amount received for each.....	28.6c.
Average amount <i>per mile</i> received for each.....	2.6c.
Freight—Tons carried.....	1,901
Average tons in each loaded car per trip.....	7.6
Average amount received for each ton.....	93.4
Articles transported.....	Tons.
Coal.....	355
Stone, lime, sand, etc.,.....	24
Lumber and other forest products.....	698
Grain, flour, and other agricultural products.....	166
Live stock.....	585
Manufactures, including agricultural implements.....	45
Merchandise.....	28
<hr/>	
Total tonnage yielding revenue.....	1,901

## EARNINGS, OPERATING EXPENSES, Etc., SEPTEMBER 13, 1880, TO JUNE 30.

## EARNINGS.

Passenger transportation.....	\$8,771 11
Freight transportation.....	1,775 69
Mail service.....	760 72
<hr/>	
Total earnings of line operated included in this report.....	\$11,307 52

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$3,649 32
Maintenance of cars.....	343 18
Motive power.....	813 54
Conducting transportation.....	4,705 89
General expenses, as follows:	
Taxes in Ohio.....	1,513 87
<hr/>	
Total operating expenses, being 97.5 per cent. of earnings (20.4 mi.)	\$11,025 80
Net earnings of 20.4 miles operated.....	281 72
Net income over operating expenses and rents paid.....	281 72
Per mile of earnings.....	\$565 37; proportion for Ohio, all 9½ months.
operating expenses...	551 29;     "     "     "     "
net earnings.....	14 08;     "     "     "     "



## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock.....	\$113,450 00
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## PAYMENTS OTHER THAN OPERATING EXPENSES.

Construction of new work.....	\$30,111 15
Purchase of C. & P. R. R.....	83,333 00
Balance .....	5 85
	<hr/> \$113,450 00

## CONDENSED GENERAL BALANCE SHEET JULY 1, 1881.

## LIABILITIES.

Account of stock .....	\$113,450 00
Excess of assets.....	179,493 70
	<hr/> \$292,943 70

## ASSETS.

28.6 miles of road .....	\$292,661 98
Cash .....	281 72
	<hr/> \$292,943 70

*State of Ohio, County of Hamilton, ss.:*

H. Brachmann, President of the Cincinnati, Georgetown and Portsmouth Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

H. BRACHMANN, *President.*

[SEAL OF R. R.]

Subscribed and sworn to before me this 14th day of September, A. D. 1881.

[SEAL.]

WM. B. CRANCH,

*Notary Public in and for Hamilton county, O.*

## CINCINNATI, HAMILTON AND DAYTON RAILROAD.

Name of road: Cincinnati, Hamilton and Dayton Railroad.

By whom owned: The stockholders.

By whom operated: Cincinnati, Hamilton and Dayton Railroad Company.

Name of company making this report: Cincinnati, Hamilton and Dayton Railroad Company.

General office at Cincinnati, O.

Principal office in Ohio at Cincinnati, O.

Address correspondence relating to this report to F. H. Short, Secretary and Treasurer, Cincinnati, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

All of this has been given in previous reports.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. H. Devereaux .....	President .....	Cleveland .....	.....
John Carlisle.....	Vice President.....	Cincinnati .....	.....
F. H. Short.....	Secretary and Treasurer ..	" .....	.....
L. Williams .....	General Manager.....	" .....	.....
Albert Griggs .....	Superintendent .....	" .....	.....
Geo. S. Huntington.....	Chief Engineer .....	" .....	.....
A. H. McLeod.....	General Freight Agent .....	" .....	.....
Samuel Stevenson .....	General Ticket Agent .....	" .....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
J. H. Devereaux.....	Cleveland .....	M. M. White .....	Cincinnati.
John Carlisle.....	Cincinnati.....	S. Burke .....	Cleveland.
H. D. Huntington .....	" .....	H. J. Jewett.....	New York.
Martin Bare .....	" .....	M. E. Ingalls .....	Cincinnati.
L. B. Harrison.....	" .....		

### CAPITAL STOCK.

#### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$3,500,000 00
Number of shares—common.....	35,000 "
Par value of each—common.....	100 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common ..... \$3,500,000 00

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.
For subscriptions paid in cash .....	25,000	\$2,500,000 00
In payment of dividends .....	10,000	1,000,000 00
Total .....	35,000	\$3,500,000 00

Stockholders, residents of Ohio, 314.

Amount of stock held by them June 30, 1881..... \$2,758,200 00

Agents authorized to transfer stock: F. H. Short, Secretary, Cincinnati, O.

Number of shares transferred within the year at such agencies, 16,608.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Bond .....	Mortgage .....	Oct. 15, 1853	May 1, 1880	7	\$1,250,000 00	\$7,000 00
" .....	" .....	July 14, 1865	July 20, 1885	7	500,000 00	494,000 00
" .....	" .....	Oct. 1, 1875	Oct. 1, 1904	7	1,000,000 00	996,000 00
" .....	" .....	" .....	" .....	6	2,000,000 00	1,454,000 00
Total .....	.....	.....	.....	.....	\$4,750,000 00	\$2,951,000 00

Average amount per mile of single main track (60 miles)..... \$49,183 33

Proportion of same for Ohio (60 miles)..... 2,951,000 00

Decrease since June 30, 1880 ..... 60,000 00

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc..... \$318,889 96

Cash securities, debit balances, etc., available to payment ..... 394,531 41

Net unfunded debt—credit..... \$75,641 45

Average amount per mile of single main track ..... \$1,260 69

Proportion of same for Ohio..... 75,641 45

Decrease since June 30, 1880 ..... 91,003 59

Total net debt liabilities..... 2,875,388 55

Total of paid in stock and debt..... 6,375,358 55

Total average amount per mile ..... \$10,625 59

Proportion of same for Ohio..... 6,375,358 55

## COST OF ROAD EQUIPMENT, Etc.

## Total expenditures for construction and real estate :

Expenditures prior to July 1, 1880..... \$4,199,636 77

Expenditures for the year ending June 30, 1881..... 47,814 57

Total expenditures to July 1, 1881..... \$4,247,451 34

Average cost per mile of road constructed (single main track, 60 miles) 70,790 85

Average cost per mile of road owned by company (single main track,  
60 miles)..... 70,790 85

Proportion of same for Ohio..... 4,247,451 34

## COST OF EQUIPMENT OWNED BY COMPANY.

33 locomotives; 35 first-class passenger cars; 376 box freight cars; 180 platform cars; 11 baggage cars; 2 mail and express cars; 91 coal cars; 24 section cars; 18 hand cars; 10 caboose cars; 1 directors' and superintendent's car; 27 stock cars; 3 wrecking cars. This shows the amount of equipment at date. The cost of each item cannot be given separately.

Total cost of railroad equipment owned by company..... \$1,118,331 71

Average amount per mile (of single main track, 60 miles) ..... 18,636 86

Proportion for Ohio (60 miles)..... 1,118,331 71

Total for road and equipment ..... 5,365,783 05

Total average amount per mile (of single main track, 60 miles)..... 89,429 72

Proportion of same for Ohio (60 miles)..... 5,365,783 05

## COST OF PROPERTY PURCHASED BY COMPANY NOT INCLUDED IN THE FOREGOING ACCOUNTS.

Real estate not included in the foregoing accounts ..... \$86,924 57

## Property held in trust for company:

Stock and bonds..... 954,597 76

Advances made to leased lines and guarantees..... 1,681,328 12

## OTHER ITEMS CHARGED TO PERMANENT INVESTMENTS.

Deshler, McComb and Toledo Railroad ..... \$39,815 44

Total permanent investment ..... 8,128,443 94

Proportion for Ohio (60 miles)..... 8,128,443 94

Average per mile (of single main track, 60 miles)..... 135,474 06

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cincinnati to Dayton .....	59.927	59.927

Total single main track.....	59.927	59.927
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Double track, New River to Schenck's.....	5.120	5.120
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Cincinnati to Lockland.....	10.850	10.850
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Aggregate of sidings and other tracks.....	23.782	23.782
--	--------	--------

Total length laid with rail computed as single track ....	99.679	99.679
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Laid with steel rail, all except sidings (main).....	59.927
“ “ (second) .....	15.970
Length in Ohio, distributed as follows:	

County.	Main track.	Double track.	Sidings, etc.	Total.
Hamilton .. ..	17.488	10.850	12.122	40.460
Warren .....	3.721	.....	579	4.300
Butler.....	24.127	5.120	6.520	35.767
Montgomery .....	14.591	.....	4.561	19.152
Totals .....	59.927	15.970	23.782	99.679

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 9 in.
Grade—Maximum, per mile.....	30.6 “
Longest maximum .....	686 “
Aggregate length of maximum .....	6.86 “
Curvature—Shortest radius .....	134.6 “
Aggregate length of shortest radius.....	3,060 “
Aggregate length of all radii .....	83,582 “
Aggregate length of tangent .....	44.05 miles.
Rail—Iron—On road (side track).....	23.782 “
Average weight per yard (originally).....	60 lbs.
Steel—On road: Main, 59.927; second track, 15,970 .....	75.897 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile .....	2 800
Ballasted—On whole line, all.	
In Ohio, all.	
With gravel.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 14; greatest age, 14 years; aggregate length.....	3.126 feet.
Iron, 1; greatest age, 1½ years; aggregate length.....	100 feet.
Total .....	3.226
Trestles—3; greatest age, 6 years; greatest height, 22 feet; greatest length, 110; aggregate length, 3.86.	
Length of shortest span of truss, 60 feet; of longest, 200; greatest length of beams between points of support, if not trussed, 24 feet.	
Greatest space between cross ties upon bridges and trestles, 2 inches; length of ties, 10 feet.	
Number of track stringers, 180.	
Are all bridges and trestles provided with guard rails? Yes.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? About every two months.	
Are the examinations analytical, and are they made by a competent person? Yes.	

Fencing—Average and Aggregated Cost.		Whole Line.	In Ohio.
Number miles fencing, computed as single line.....		120	120
Kind of fencing, as follows:			
Post and board (average cost per rod, \$1.28.)			
Wire (average cost per rod, \$1.00), 5 wire .....		2½	2½
Length of road unfenced, and the reason therefor: The road has all been fenced.			

CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?	
Marietta and Cincinnati Railroad at Cincinnati.	
Cincinnati and Springfield Railroad at Dayton.	
Number of crossings of highways at grade in this State without protection.....	90
Number of crossings of highways at grade in this State at which there are gates or flagmen .....	17
Number of crossings of highways over railroad.....	1
“ “ “ under railroad .....	5
Number of highway bridges 18 feet above track....	4
Do all trains stop at railroad crossings as required by law? Yes.	
Are flagmen stationed at each? Yes.	

STATIONS AND TELEGRAPH.

TELEGRAPH LINE.

Miles on line of road operated.....	60
Miles of same owned by railroad company.....	60

STATIONS.

Passenger and freight .....	42
Number with telegraph communication .....	25
Number of same operated by railroad company .....	25
Is pay received for messages sent over line owned by railroad company? Yes.	

ROLLING STOCK.

Locomotives.....	33;	Average weight, lbs.....	68,340
Express and baggage cars.....	13;	“ “ .....	36,000
Passenger cars.....	35;	“ “ .....	35,000
Freight cars.....	674;	“ “ .....	18,000
Other cars .....	14;	“ “ .....	17,000
Number of locomotives equipped with train brakes, 17.			
Kind of brake: Westinghouse air.			
Number of cars equipped with train brakes, 48.			
Kind: Westinghouse air.			
Number of passenger cars with “Miller Platform,” 35.			
Method of bridging between passenger cars, when two or more are run in trains:			

Miller Platform and buffer.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Wood or coal. Part with Baker heaters.

Means of lighting same: Candles or oil.

#### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	28 miles per hour.
Mail and accommodation, " .....	23 "
Freight trains, " .....	10 "

#### EMPLOYES.

Superintendents.....	1
Telegraph operators .....	21
Engineers.....	36
Baggagemen.....	26
Flagmen, switch-tenders and watchmen.....	66
Laborers .....	211
Clerks .....	121
Train dispatchers.....	3
Firemen .....	41
Wipers.....	11
Mechanics .....	218
Conductors.....	16
Brakemen .....	45
Station agents.....	27
Section men .....	107
Other employes .....	106
Proportion for Ohio .....	1056

#### EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American and United States.

Terms: American, \$7.50 per day for 4,000 lbs. north, and 2,000 south, between Cincinnati and Hamilton, and 15 cents per 100 lbs. excess. United States, \$1.00 per day for 10,000 lbs., between Cincinnati and Toledo, and 2,000 additional between Cincinnati and Hamilton, daily average, and 55 cents per 100 for excess.

#### AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

The figures below can only be given as estimates, subject to usage, quality, location, etc.:

Equipment and Superstructure.	Average Life in Years.
Ties—Oak—Estimated .....	7
Telegraph poles—Cedar—Estimated .....	10
Other—Estimated .....	12
Fence posts—Estimated .....	10



## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles .....	10c.	3c.	Est'd 3½c.
For distances over 8 mi.—1st class...	3c.	3c.	3c.
Excursion	2c.	½c.	Est'd 1c.

Amount charged in addition to regular fares, in sleeping or other cars run on your road: For seat, 50c. and \$1.00, according to destination; berth, \$2.00; section, \$4.00; state room, \$5.00.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

	Highest.	Lowest.	Average.
First class .....	10.00 Cts.	1.05 Cts.	5.00 Cts.
Second class .....	8.00	1.25	4.50
Third class .....	6.00	1.00	3.50
Fourth class .....	5.00	0.75	2.50
Fifth class .....	4.00	0.50	2.00
Special class .....	2.50	0.40	1.50

Rate per ton per mile on freight carried less than 30 miles:

First class .....	30.00	5.17	17.50
Second class .....	30.00	4.14	17.00
Third class .....	30.00	3.45	15.00
Fourth class .....	30.00	3.10	15.00
Fifth class .....	25.00	2.76	14.00
Special class .....	25.00	2.58	13.00

Rate per ton per mile on freight carried more than 30 miles:

First class .....	6.13	2.25	4.00
Second class .....	5.16	1.75	3.50
Third class .....	3.87	1.50	2.50
Fourth class .....	3.23	1.00	2.00
Fifth class .....	3.00	0.75	2.00
Special class .....	2.42	0.70	1.50

Rate per ton per mile for—

Coal—Carried ten miles or more .....	5.00	0.50	1.25
Carried less than ten miles .....	25.00	5.⁵⁄₉	10.00
Pig iron—Carried 10 miles or more .....	5.00	0.65	1.50
Carried less than 10 miles .....	25.00	5.⁵⁄₉	10.00
Limestone—Carried 10 miles or more .....	5.00	0.65	1.50
Carried less than 10 miles .....	25.00	5.⁵⁄₉	10.00
Iron ore—Carried 10 miles or more .....	5.00	0.65	1.50
Carried less than 10 miles .....	25.00	5.⁵⁄₉	10.00
Undressed stone or lumber—Carried 10 miles or more ...	5.00	0.75	1.50
Carried less than 10 miles...	25.00	5.⁵⁄₉	10.00

## Rate per 100 lbs. for loading:

First class .....	4.25	3.75	4.00
Second class .....	3.00	3.00	3.00
Third class .....	1.50	1.50	1.50
Fourth class .....	1.50	1.50	1.50
Fifth class .....	1.50	1.50	1.50
Special class .....	1.25	1.25	1.25

## Rate per 100 lbs. for unloading:

First class .....	4.25	3.75	4.00
Second class .....	3.00	3.00	3.00
Third class .....	1.50	1.50	1.50
Fourth class .....	1.50	1.50	1.50
Fifth class .....	1.50	1.50	1.50
Special class .....	1.25	1.25	1.25

## DOINGS OF THE YEAR ENDING JUNE 30TH.

## Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length.
No. 5, Mill Creek, Carthage .....	Howe Truss.....	Wood .....	110 feet.
No. 6, Carthage, over pike .....	" .....	" .....	60 "

Trestles built in Ohio, 1; aggregate length, 110 feet; length filled and converted into embankment, 36 feet.

Fencing in Ohio—Miles of single fence built: None but repairs.

Rail laid—Steel, 60 lbs. per yard.

Train mileage—Passenger .....	315,741
Freight .....	167,517
Mixed .....	240,390
Construction .....	25,141

Total.....	748,789
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Car mileage—Passenger .....	1,265,187
Express and baggage .....	399,620
Freight—loaded .....	3,537,051
empty .....	844,212
Caboose .....	147,203

Total.....	6,193,273
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Fuel consumed—Wood, 773 cords; coal, 22,968½ tons; total cost.....	\$62,320 04
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Losses, etc., paid—On goods and baggage .....	5,303 36
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## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Sale of other stocks, bonds and securities.....	\$22,455 60	
Increase of floating debt.....	77,750 00	
Equipment .....	600 00	
		<u>\$100,805 60</u>

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$182,604 69	
Premiums and commissions for paying coupons.....	202 49	
Interest on floating debt.....	1,440 88	
Dividends, rate 2 per cent. on general stock.....	70,000 00	
Last dividend declared on general stock: Nov. 8, 1880.		
Bonds of company canceled.....	60,000 00	
Applied to sinking fund.....	24,000 00	
Construction of new work .....	87,630 01	
Discount on bonds.....	14,500 00	
Profit and loss .....	3,439 34	
		<u>\$443,817 41</u>

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock.....	\$3,500,000 00	
First mortgage bonds .....	7,000 00	
Second mortgage bonds .....	494,000 00	
Consolidated mortgage bonds.....	2,450,000 00	
Surplus earnings.....	1,933,582 22	
Coupons unpaid .....	29,278 45	
Dividends unpaid.....	7,775 59	
Bills payable.....	77,750 00	
Cincinnati, Richmond & Chicago lessors.....	7,242 91	
Railroad and individual account .....	196,843 01	
		<u>\$8,703,472 18</u>

## ASSETS.

Construction.....	\$3,874,892 94	
Equipment .....	1,118,331 71	
Real estate .....	372,558 40	
Stock and bonds .....	954,597 76	
Material for repairs .....	180,491 83	
F. H. Short, Trustee.....	86,924 57	
Cincinnati, Richmond & Ft. Wayne R. R.....	220,514 70	
Dayton & Michigan R. R., lessors .....	565,259 39	
Cincinnati, Hamilton & Indianapolis R. R.....	895,554 03	
McComb, Deshler & Toledo R. R.....	39,815 44	
Railroad and individual account .....	73,154 03	
Cash and cash assets.....	318,560 23	
Bills receivable .....	2,817 15	
		<u>\$8,703,472 18</u>

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880.				
1	July	George Holt	Boy	Jumped from train	Concussion of brain.
2	13	Nat. Gardner	Laborer	Fell into turn-table pit	Broken leg.
3	12	Jas. O. Berine	"	Jolted while using knife	Arm cut near wrist.
4	Aug.	John Snapp	Passenger	Jumped or fell from train	Broken leg and other injuries.
5	July	Mrs. Overlander	"	Walking on track	Severed in two.
6	Aug.	Jacob Winkler	"	Crossing track on wagon	Bones broken and other injuries.
7	July	T. Costello	"	Pulling pin	Thumb smashed.
8	Aug.	Wm. McMannus	Brakeman	Lying on track	Mangled.
9		Harvy Simons	Laborer	Slipped getting on cars	Toes of one foot cut off.
10		Thomas Young	Passenger	Rail falling	Left foot mashed.
11		Patrick Collins	Helper	Bale of cotton falling on	Internal injuries.
12		Robert Gibbons	Laborer	Run into by car	Mangled.
13	Sept.	Barney Farley	Citizen	Hand caught by mill	Hand crushed.
14	Aug.	P. Mulney	Switchman	Knocked down and ran over	Leg bruised.
15	Sept.	F. Leanheart	Citizen	Walking on track	Bruised.
16		James O'Neil	"	Crossing track with wagon	Bruised and cut.
17		E. M. Bryant	"	Attempting to board train	Foot mashed.
18		Mrs. Ferguson	Passenger	Slipped getting off train	Side and arm bruised.
19		H. Purdonc	Brakeman	Coupling cars	Breast and shoulder squeezed.
20		T. Connell	Foreman	Foot caught in frog	Run over and mangled.
21	Oct.	Thomas O'Brien	Section laborer	Walking on track	Legs run over.
22		Michael Cox	Switchman	Coupling cars	Hand crushed.
23		A. C. Jones	Passenger	Rear collision	Scalded and head cut.
23		Sarah Mahan	"	"	Scalded.
23		Maggie Mahan	"	"	Hand scalded.
23		David Kennedy	"	"	Badly scalded.
23		Frank Mahan	"	"	Head and hands scalded.
23		Philip Keehan	"	"	Hands and face "
23		Chas. Keehan	"	"	"
23		Samuel Bake	"	"	"
23		F. L. Thompson	"	"	Both legs broken.
23		King Carson	"	"	Hands cut by glass.
23		Jesse Kirkwood	"	"	Hands and face scalded.

## ACCIDENTS IN OHIO—Continued.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1880.				
Oct. 20	J. W. Morgan.....	Passenger.....	Rear collision ..	Hands and face cut by glass.
23	Miss J. W. March .....	" .....	" .....	" .....
23	J. W. March .....	" .....	" .....	Slightly scalded.
23	H. Y. Miller .....	" .....	" .....	Hand scalded and cut.
24	Mrs. A. Blossom.....	" .....	Jumped from train .....	Slightly bruised.
24	Mrs. T. F. Lyons .....	" .....	" .....	" .....
25	B. C. Decker .....	Brakeman .....	Coupling cars .....	Left leg badly crushed.
26	Daniel Stimmel .....	" .....	" .....	Head severed from body.
27	Wm. Wineman .....	Tel. repairer.....	Jumped from train .....	Bruised and thumb hurt.
29	Joseph McDermott.....	Brakeman.....	Coupling cars .....	Thumb mashed.
30	Geo. Zeigler.....	Laborer.....	Unloading coal cars .....	Finger mashed.
1881.				
Jan. 18	Col. Keiser .....	Passenger .....	Stepping off train .....	Scratched up.
31	James Smith.....	Foreman .....	Stepped in front of engine .....	Crushed under engine.
32	John Higgins .....	Laborer .....	Unloading car.....	Heel badly cut.
33	Thomas Holland .....	" .....	Fell from car.....	Ankle fractured.
34	J. P. Blakeslee .....	" .....	Walking close to track.....	Bruised and injured.
35	Morris Murphy .....	Boy, 12 years old..	Jumped from train .....	Leg mangled.
36	James Boland.....	" .....	Struck by train.....	Leg mangled and other injuries.
37	Thomas Drogan.....	Citizen .....	" .....	Head hurt and foot cut off.
38	— Sortinann.....	Girl, 9 years old..	" .....	Shoulder dislocated.
39	Mike Dowd.....	Passenger .....	Caught between buffers .....	Foot crushed.
40	Aug. Wendler.....	" .....	Pushed or fell from train .....	Spine injured.
41	Jacob Fichter.....	" .....	Crossing track in buggy.....	Crushed and killed.
42	Edward Hardin .....	" .....	Attempting to board train .....	Foot bruised badly.
43	Benj. Oxley.....	Passenger .....	Jumped through window.....	Slight cut in head.
44	Samuel Burgin.....	Brakeman.....	Coupling cars .....	Breast squeezed.
45	Joe Hogan.....	Laborer.....	Unloading machinery.....	Toe amputated.
46	Wm. Spensberger .....	Switchman .....	Coupling cars .....	Heel run over.



## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Run over in yards, on sidings, or in switching.....	1
Coupling, or crushed between cars and engine.....	1
Lying, walking, falling, or being on track.....	2
Catching foot in frog or between rails—run over.....	1
Miscellaneous.....	1
Others—Riding or driving across track.....	3
Lying, walking, falling, or being on track.....	4
Total.....	13

## PERSONS INJURED—CAUSES.

Passengers—Getting on or off engine or train in motion.....	9
Falling or thrown from engine or train.....	1
Collisions.....	15
Miscellaneous.....	1
Employees—Coupling, or caught between cars and engine.....	7
Falling or thrown from engine or train.....	1
Miscellaneous.....	7
Others—Getting on or off engine or train in motion.....	3
Lying, walking, falling, or being on track.....	4
Total.....	48

## RECAPITULATION.

Killed—Employees—from causes beyond their control..	2
from misconduct or want of caution.....	4
	6
Others—at stations and highway crossings.....	3
trespassing on track, etc.....	4
	7
Total killed.....	13
Injured—Passengers—from causes beyond their control.....	15
misconduct or want of caution.....	11
	26
Employees—from causes beyond their control.....	7
misconduct or want of caution.....	8
	15
Others—at stations and highway crossings.....	1
stealing rides.....	2
trespassing on track, etc.....	4
	7
Total injured.....	48

## TRAIN ACCIDENTS—ENTIRE LINE.

Number.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	July 13	Poast Town .....	Freight .....	Rear end collision .....	Slight damage.
2	Aug. 4	Hamilton .....	Engine .....	Switch open .....	Engine derailed.
3	" 4	" .....	Gravel .....	Running fast .....	Car broken.
4	29	" .....	Pass'r & fr'ght .....	Rear end collision .....	No damage.
5	30	Belmore .....	Freight .....	Train parted .....	Draw-bars broken.
6	Sept. 29	Schenck's .....	Pass'r & fr'ght .....	Mistaken orders .....	Freight cars wrecked.
7	Oct. 9	Mill creek .....	Freight .....	Run into by M. & C. .....	Two cars destroyed.
8	Nov. 26	Hamilton .....	Engine .....	Switch set wrong .....	No damage.
9	Dec. 3	Miamisburg .....	Freight .....	Broken rail .....	Cais derailed.
10	Oct. 20	Jones' .....	Passenger .....	Mistaken order .....	Cars and engine destr'd.

## SUMMARY OF TRAIN ACCIDENTS.

Number:

Accidents causing derailment of trains .....	2
Accidents not resulting in derailment of train .....	8
Collisions—crossing .....	2
rear .....	3

Total accidents ..... 10

Causes of accidents effecting derailment of trains:

Broken rail .....	1
Misplaced switch .....	1

Total .....

Causes of collisions:

Cars on main track .....	1
Fog .....	1
Orders—absence of, mistake in, neglect or disobedience to .....	1
Sudden derailment of train on opposite track .....	2

Total .....

Total derailments .....

Total collisions .....

Total accidents .....

*State of Ohio, County of Cuyahoga ss.:*

Lewis Williams, General Manager of the Cincinnati, Hamilton and Dayton Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement, of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

LEWIS WILLIAMS,

General Manager.

Subscribed and sworn to before me, this 30th day of August, A. D. 1881.

J. T. WANN,

[SEAL]

Notary Public.

# CINCINNATI, HAMILTON AND INDIANAPOLIS RAILROAD COMPANY.

Name of road: Cincinnati, Hamilton and Indianapolis Railroad.

By whom owned: Cincinnati, Hamilton and Indianapolis Railroad Company.

By whom operated: Cincinnati, Hamilton and Dayton Railroad Company.

By what authority: Stock ownership.

Name of company making this report: Cincinnati, Hamilton and Indianapolis Railroad Company.

General office at Cincinnati, O.

Principal office in Ohio at Hamilton, O.

Address correspondence relating to this report to F. H. Short, Secretary and Treasurer, at Cincinnati, O.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. H. Devereux.....	1 resident.....	Cleveland .....	.....
H. D. Huntington .....	Vice President.....	Cincinnati'.....	.....
F. H. Short.....	Secretary and Treasurer ..	" .....	.....
L. Williams .....	General Manager.....	" .....	.....
A. Griggs .....	Superintendent .....	" .....	.....
A. H. McLeod .....	General Freight Agent .....	" .....	.....
Samuel Stevenson .....	General Ticket Agent .....	" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
J. H. Devereux.....	Cleveland .....	L. Williams .....	Cincinnati .....
H. D. Huntington .....	Cincinnati .....	Stevenson Burke .....	Cleveland .....
Jno. Carlisle .....	" .....	Wm. Beckett .....	Hamilton .....
Martin Bare.....	" .....	J. M. Ridenour .....	Ind'polis, Ind...
F. H. Short.....	" .....		

## CAPITAL STOCK.

### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common ..... \$2,500,000 00  
 preferred..... 279,766 90

Total..... \$2,779,766 90

Number of shares—common .....	25,000
preferred .....	2,797
Total.....	27,797
Par value of each—common.....	\$100 00
preferred.....	100 00
Increase since June 30, 1880—preferred.....	279,766 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	*\$2,500,000 00
preferred.....	279,766 90
Total paid in capital stock—preferred.....	279,766 90
Increase since June 30, 1880—preferred.....	279,766 90
Average amount paid in per mile of single main track (98.2 miles).....	279,766 90

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

None issued to the public.

On what account.	No. shares.	Amount of common.	Amount of preferred.
In payment of interest on bonded debt .....	2,797 & frac.		2,797 & frac.
Held by C., H. & D. R. R .....	25,000	\$2,500,000 00	
Total .....	27,797	\$2,500,000 00	\$2,779,766 90

Stockholders, residents of Ohio, 97.

Amount of stock held by them June 30, 1881 ..... \$205,966 00

Agents authorized to transfer stock: F. H. Short, Secretary and Treasurer, Cincinnati, O.

Number of shares transferred within the year at such agencies, 914.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Bond .....	Mortgage .....	July 3, 1873...	July 1, 1893...	7	\$2,500,000 00	\$2,500,000 00
Total .....					\$2,500,000 00	\$2,500,000 00

Average amount per mile of single main track (98.2 miles).. \$25,458 25

Proportion of same for Ohio (19.5 miles)..... 483,706 75

\* Belongs to Cin., Ham. &amp; Dayton R. R. Co.

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$949,069 03	
Total unfunded debt.....		\$949,069 03
Average amount per mile of single main track.....	\$9,664 65	
Proportion of same for Ohio.....	188,280 68	"
Decrease since June 30, 1880 .....	317,620 04	
		<hr/>
Total net debt liabilities.....		3,449,069 03
Average amount per mile of single main track .....	\$35,122 90	
Proportion of same for Ohio.....	684,896 55	
		<hr/>
Total of paid in stock and debt.....		3,728,835 93
Total average amount per mile .....	\$37,971 85	
Proportion of same for Ohio .....	740,451 07	

## COST OF ROAD EQUIPMENT, ETC.

## ROAD ACQUIRED BY PURCHASE.

Cincinnati and Indianapolis Junction R. R.....	\$1,890,000 00	
Original cost—don't know.		
Subsequent expenditures for construction and real estate .....	606,167 60	
		<hr/>
Total expended for construction and purchase .....		\$2,496,167 60
Average cost per mile of road constructed (single main track, 98.2 miles)		25,419 22
Average cost per mile of road owned by company (single main track, 98.2 miles).....		25,419 22
Proportion of same for Ohio (19.5 miles).....		495,674 79

## COST OF EQUIPMENT OWNED BY COMPANY.

15 locomotives; 6 passenger cars; 333 box freight cars; 58 platform cars; 4 baggage cars; 28 coal cars; 15 section cars; 22 hand cars; 8 caboose cars; 50 stock cars; 2 wrecking cars. This shows the amount of equipment to date. The cost of each class cannot be given separately.

Total cost of railroad equipment owned by company.....	\$228,472 48
Average amount per mile (of single main track, 98.2 miles) .....	2,326 60
Proportion for Ohio (19.5 miles) .....	45,368 70
Total for road and equipment .....	2,724,640 08
Total average amount per mile (of single main track, 98.2 miles) .....	27,745 82
Proportion of same for Ohio, (19.5 miles).....	540,543 49

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Hamilton to Indianapolis.....	98.2 miles.	19.5 miles.
Total single main track.....	98.2 "	19.5 "
Aggregate of sidings and other tracks.....	8.9 "	1.735 "
Total length laid with rail computed as single track...	107.1 miles.	21.235 miles.
Laid with steel rail.....	20. "	20. "
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Butler.....	19.5	1.735	21.235
Totals .....	19.5	1.735	21.235
Steel rail .....	None .....		

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Grade—Maximum, per mile.....	65 feet.
Longest maximum .....	19,060 "
Aggregate length of maximum .....	80,572 "
Curvature—Shortest radius .....	1,146 "
Aggregate length of shortest radius .....	2,006 "
Aggregate length of all radii .....	75,504 "
Aggregate length of tangent .....	84.60 miles.
Rail—Iron—Average weight per yard—Originally.....	60 lbs.
Steel—On road—In Ohio.....	19.5 miles.
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	2,640.
Ballasted—On whole line.....	98.2 miles.
In Ohio.....	19.5 "
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	3; greatest age.....	8 years; aggregate length.....	1,004 feet.
Total.....			1,004 feet.
Trestles—2; greatest age, 7 years; greatest height, 12 feet; greatest length, 90 ft.; aggregate length, 142 feet.			
Length of shortest span of truss, 42 ft.; of longest, 165 ft.; greatest length of beams between points of support, if not trussed, 24 ft.			
Greatest space between cross ties upon bridges and trestles, 2 inches; length of ties, 10 feet.			
Number of track stringers, 58.			
Are all bridges and trestles provided with guard rails? Yes.			

Do all bridges and trestles receive stated examinations? Yes.

How often? Average two months.

Are the examinations analytical, and are they made by a competent person? Yes.

#### FENCING—AVERAGE AND AGGREGATE COST.

Road all fenced in Ohio, 19.5 miles.

#### CROSSINGS.

Number of crossings of highways—Over railroad	} In Ohio .....	5
Under railroad		5
Highway bridges 18 feet above track.....		7
Less than 18 feet above track; built by city of Hamilton—16 feet, 4 inches from rail.....		1

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated.....	98.2; in Ohio.....	19.5
Miles of same owned by railroad company.....	98.2; " .....	19.5

##### STATIONS.

Passenger and freight.....	37; in Ohio.....	9
Number with telegraph communication.....	15; " .....	2
Number of same operated by railroad company.....	15; " .....	2
Is pay received for messages sent over line owned by railroad company? Yes.		

#### ROLLING STOCK.

Locomotives.....	15; average weight—lbs.....	67,640
Express and baggage cars.....	4; .....	26,000
Passenger cars.....	6; .....	35,000
Freight cars.....	469; .....	18,000
Other cars.....	10; .....	17,000

Number of locomotives equipped with train brakes, 5.

Kind of brake: Westinghouse Air.

Number of cars equipped with train brakes, 10.

Kind: Westinghouse Air.

Number of passenger cars with "Miller Platform", 6.

Method of bridging between passenger cars, when two or more are run in trains: Miller Platform and Buffer.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Wood and coal.

Means of lighting same: Oil and candles.



## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	24 miles per hour.
Mail and accommodation.....	24      "
Freight trains .....	10      "

## EMPLOYEES.

Superintendents.....	1
Telegraph operators .....	5
Engineers .....	15
Baggagemen .....	3
Flagmen, switch-tenders and watchmen .....	17
Laborers .....	27
Clerks .....	14
Train dispatchers.....	3
Firemen.....	15
Wipers.....	4
Mechanics .....	26
Conductors.....	9
Brakemen.....	17
Station Agents .....	21
Section men.....	84
Other employes .....	6

Total number employed by company in operating line.....	267
Proportion for Ohio.....	83

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: United States Express Co.  
 Terms: \$20 per day for 4,000 lbs., and 33 $\frac{1}{3}$  cents per 100 excess.

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—	Highest.	Lowest.	Average.
For distances less than 8 miles .....	10 Cts.	3 Cts.	* 3 $\frac{1}{2}$ Cts.
For distances over 8 miles—1st class .....	3	3	3
Excursion.....	2	* $\frac{1}{2}$	* 1
Amount charged in addition to regular fares, in sleeping or other cars run on your road: For seat, 50 cts. and \$1.00, according to destination; berth, \$2.00; section, \$4.00; state room, \$5.00.			

\* Estimated.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
	Cts.	Cts.	Cts.
First class.....	10.	1.5	5.
Second class.....	8.	1.25	4.5
Third class.....	6.	1.	3.5
Fourth class.....	5.	.75	2.5
Fifth class.....	4.	.50	2.
Special class.....	2.5	.40	1.5

Rate per ton per mile on freight carried less than 30 miles :

First class.....	30.	5.17	17.5
Second class.....	30.	4.14	17.
Third class.....	30.	3.45	15.
Fourth class.....	30.	3.1	15.
Fifth class.....	25.	2.76	14.
Special class.....	25.	2.58	13.

Rate per ton per mile on freight carried more than 30 miles :

First class.....	6.13	2.25	4.
Second class.....	5.16	1.75	3.5
Third class.....	3.87	1.50	2.5
Fourth class.....	3.23	1.	2.
Fifth class.....	3.	.75	2.
Special class.....	2.42	.70	1.5

Rate per ton per mile for—

Coal—Carried ten miles or more.....	5.	.50	1.25
Carried less than ten miles.....	25.	5. $\frac{5}{9}$	10.
Pig iron—Carried ten miles or more.....	5.	.65	1.50
Carried less than ten miles.....	25.	5. $\frac{5}{9}$	10.
Limestone—Carried ten miles or more.....	5.	.65	1.50
Carried less than ten miles.....	25.	5. $\frac{5}{9}$	10.
Iron ore—Carried ten miles or more.....	5.	.65	1.50
Carried less than ten miles.....	25.	5. $\frac{5}{9}$	10.
Undressed stone or lumber—Carried 10 miles or more.....	5.	.65	1.50
Carried less than 10 miles.....	25.	5. $\frac{5}{9}$	10.

Rate per 100 lbs. for loading :

First class.....	4.25	3.75	4.
Second class.....	3.	3.	3.
Third class.....	1.50	1.50	1.50
Fourth class.....	1.50	1.50	1.50
Fifth class.....	1.50	1.50	1.50
Special class.....	1.25	1.25	1.25

Rate per 100 lbs. for unloading :

First class.....	4.25	3.75	4.
Second class.....	3.	3.	3.
Third class.....	1.50	1.50	1.50
Fourth class.....	1.50	1.50	1.50
Fifth class.....	1.50	1.50	1.50
Special class.....	1.25	1.25	1.25

## DOINGS OF THE YEAR ENDING JUNE 30.

Fencing in Ohio—Miles of single fence built: None, but repairs.

Rail laid—Steel, 60 lbs. per yard—miles of track, 6.

Train mileage—Passenger.....	135,010	
Freight .....	277,187	
Mixed .....	64,965	
Construction .....	8,329	
Total .....		485,491
Car mileage—Passenger.....	303,561	
Express and baggage.....	125,805	
Freight—loaded.....	2,484,240	
Freight—empty.....	703,807	
Caboose .....	190,932	
Total .....		3,808,345
Fuel consumed—Wood, 413½ cords; coal, 16,465 tons. Total cost.....		\$41,360 89
Losses, etc., paid—On goods and baggage .....		2,717 91
For injuries in Ohio, fatal and non-fatal:		
To employes .....		114 00
For animals killed in Ohio:		
11 horses.....	\$901 05	
1 mule.....	50 00	
34 cattle .....	469 98	
5 sheep .....	15 00	
5 hogs .....	20 00	
Total .....		\$1,456 03
Amount claimed in litigation, etc., for injuries in Ohio to persons: Unknown.		

## TRANSPORTATION.

Passengers—Number carried, local .....	151,470	
through .....	6,712	
Total .....		158,182
Average number carried in each car per trip.....	32 <sup>11.3</sup> <sub>100</sub>	
Average number of miles traveled by each.....	21 <sup>8.8</sup> <sub>100</sub>	
Total mileage, or number carried one mile.....		3,461,329
Average amount received for each .....	72 <sup>8</sup> <sub>100</sub> cents.	
Average amount <i>per mile</i> received for each.....	3.327	"
Freight—Tons carried, local.....	277,541	
through.....	65,706	
Total .....		343,247
Average tons in each loaded car per trip.....	9.87	
Average tons in each loaded car per mile .....	10.39	
Total movement, or tons carried one mile ....		25,823,673

Average amount received for each ton.....	83½ cents.
Average amount <i>per mile</i> received for each ton .....	1.111 "
Average cost per ton freight per mile: No way of ascertaining.	
Average amount received for each ton through freight.....	77 cents.
Average amount received for each ton local freight.....	85 "
Average cost each ton through freight: No way of ascertaining.	
Average cost each ton local freight: No way of ascertaining.	

## Articles transported:

Articles transported.	Tons.	Per cent.
Coal .....	13,359	3.90
Stone, lime, sand, etc.....	7,516	2.20
Petroleum .....	2,327	0.67
Ores.....	1,629	0.47
Pig and bloom iron.....	14,319	4.17
Manufactured iron .....	7,557	2.20
Lumber and other forest products.....	57,342	16.73
Grain, flour, and other agricultural products.....	144,483	42.09
Live stock.....	26,762	7.80
Animal products .....	5,315	1.55
Manufactures, including agricultural implements.....	10,699	3.12
Merchandise .....	50,363	14.65
Miscellaneous .....	1,566	0.45
Total tonnage yielding revenue .....	343,247	100
Supplies for company's use .....	27.50	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30TH

### EARNINGS.

Passenger transportation—local.....	\$103,543	49
through .....	11,623	84
Total .....		\$115,167 33
Freight transportation—local.....	\$235,960	99
through . ....	50,917	68
Total .....		286,878 67
Mail service.....		6,714 34
Express service .....		6,326 83
Other sources ...		22,362 50
Total earnings of line operated included in this report.....		\$437,449 67

OPERATING EXPENSES.

Maintenance of way and structures.....	\$113,094	02
Maintenance of cars .....	48,737	04
Motive power .....	96,068	55
Conducting transportation .....	57,041	13

General expenses:		
Taxes in Ohio.....	\$1,243 86	
“ Indiana .....	8,462 34	
Salaries .....	12,175 56	
Other general expenses of operating .....	9,888 66	
	<hr/>	31,770 36
Total operating expenses, being 79.26 per cent. of earnings.....		\$346,711 10
Net earnings of 98.2 miles operated .....		\$90,738 57
Rentals paid, Union Railroad, Indianapolis .....		6,000 00
		<hr/>
Net income over operating expenses and rents paid .....		\$84,738 57
Per mile of earnings, \$4,454.68; proportion for Ohio (19.5 miles) .....		86,866 26
operating expenses, \$3,530.66; proportion for Ohio (19.5 mi.)		68,847 87
net earnings, \$924.02; “ “		18,018 39

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Sale of car .. ..	\$600 00
Income on sinking fund investment, C. H. & D. R. R.....	41,378 17
	<hr/>
Total .....	\$41,978 17

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$126,000 00
Premiums and commissions for paying coupons.....	116 74
	<hr/>
Total .....	\$126,116 74

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock—preferred .....	\$279,766 90
Coupons unpaid.....	53,515 00
First mortgage bonds .....	2,500,000 00
Cincinnati, Hamilton and Dayton R. R.....	895,554 03
	<hr/>
	\$3,728,835 93

## ASSETS.

Construction ....	\$2,436,087 69
Equipment.....	228,472 48
Real estate.....	51,101 91
Steam excavator.....	8,978 00
Profit and loss.....	1,004,195 85
	<hr/>
	\$3,728,835 93

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	Aug. 10.	Wm. Rankins.	Brakeman...	Struck by overhead bridge..	Cut in back of head.

## SUMMARY OF ACCIDENTS.

## PERSONS INJURED—CAUSES.

Employees—Struck by bridge, chute, or other obstruction..... 1

## RECAPITULATION.

Injured—Employees—misconduct or want of caution..... 1

## TRAIN ACCIDENTS—ENTIRE LINE.

Number.	Date.	Place.	Character of train.	Causes of accident.	Effect of accident.
1	1880				
2	July 22	Connorsville .....	Freight.....	Rear end collision.....	Slight damage.
3	July 23	Indianapolis, Ind...	Switch .....	No signal.....	Flat car injured.
4	Sept. 1	Rushville .....	Freight.....	Train parted .....	Caboose damaged.
5	Oct. 20	Indianapolis, Ind...	Passenger .....	Switch unlocked .....	Cars scratched.
6	Oct. 23	" .....	Switch .....	Backing train .....	Engine damaged.
7	Nov. 10	" .....	" .....	Backing engine .....	" .....
8	Nov. 27	" .....	Freight.....	Backed into .....	Cars .....
	1881				
8	Feb. 15	" .....	" .....	Switch open.....	" .....

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents not resulting in derailment of train..... 8

Collisions—butting .....

rear .....

Total accidents..... 8

## Causes of collisions:

Cars on main track .....

Fog.....

Misplaced switch .....

Running carelessly .....

Train breaking in two.....

Unexplained .....

Total.....

Total collisions..... 8

Total accidents .....

*State of Ohio, County of Cuyahoga, ss.:*

Lewis Williams, Gen'l Manager Cincinnati, Hamilton and Indianapolis R. R. Co., being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed)

LEWIS WILLIAMS, *Gen'l Manager.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 30th day of August, A. D. 1881.

J. T. WANN,

[SEAL.]

*Notary Public.*



## CINCINNATI, INDIANAPOLIS, ST. LOUIS AND CHICAGO RAILWAY COMPANY.

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Name of road: Cincinnati, Indianapolis, St. Louis and Chicago Railway.

By whom owned: Cincinnati, Indianapolis, St. Louis and Chicago Railway Company.

By whom operated: Cincinnati, Indianapolis, St. Louis and Chicago Railway Company.

By what authority: See history of organization below.

Name of person making this report: E. F. Osborn, Secretary Cincinnati, Indianapolis, St. Louis and Chicago Railway Company.

General office at Cincinnati, O.

Principal office in Ohio at Cincinnati, O.

Address correspondence relating to this report to E. F. Osborn, Secretary, at Cincinnati, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Cincinnati, Indianapolis, St. Louis and Chicago Railway Company, acquired by purchase at foreclosure sale on the second day of February, 1880, the road and property of the Indianapolis, Cincinnati and La Fayette Railroad Company, and the Cincinnati and Indiana Railroad Company. The road extends from Cincinnati, Ohio, to La Fayette, Indiana. This company operates under an agreement the Harrison Branch Road from Valley Junction, Ohio, to Harrison, Ohio, 7.75 miles. Under terms of agreement the Cincinnati, Indianapolis, St. Louis and Chicago Railway Company guarantees 7 per cent. per annum on \$200,000.00 capital stock of the Harrison Branch Railroad Company. M. E. Ingalls, President of Harrison Branch; office, Cincinnati, Ohio.

This company also operates the Cincinnati, La Fayette and Chicago Railroad Company, from Templeton, Indiana, to Kankakee, Illinois, 56.30 miles, under an agreement guaranteeing the operating expenses, and 7 per cent. interest on \$1,120,000.00 first mortgage bonds. M. E. Ingalls, President Cincinnati, La Fayette and Chicago Railroad; office, Cincinnati, Ohio.

It also owns and operates a branch, called the Fairland, Franklin and Martinsville Road, from Fairland, Indiana, to Martinsville, Indiana, 38.30 miles, and the earnings and expenses of this branch are included in the earnings and expenses of this company, as are also the earnings

of the Cincinnati, La Fayette and Chicago Railroad from the 1st of September, 1880, and the surplus of earnings (if any) of the Harrison Branch, over and about the 7 per cent. guaranteed on \$200,000 capital stock.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
M. E. Ingalls .....	President .....	Cincinnati, O .....	.....
E. F. Osborn .....	Secretary and Treasurer ...	" .....	.....
J. W. Sherwood .....	General Superintendent ...	Indianapolis, Ind .....	.....
T. O. Morris .....	Chief Engineer .....	" .....	.....
Jno. Egan .....	General Passenger Agent and Gen'l Ticket Agent...	Cincinnati, O .....	.....
H. J. Page .....	General Freight Agent.....	" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
M. E. Ingalls .....	Cincinnati, O.	Larz Anderson .....	Cincinnati, O.
Geo. Hoadly .....	"	J. H. Devereux .....	Cleveland, O.
S. J. Broadwell .....	"	T. A. Morris .....	Indianap's, Ind.
Geo. Wilshire .....	"	T. H. Sharpe .....	"
Jno. King, Jr. ....	"	Geo. Bliss .....	New York City.
B. F. Evans .....	"	C. G. Landon .....	"
C. W. West .....	"		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$4,000,000 00
Number of shares—common .....	40,000
Par value of each—common .....	100 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$4,000,000 00
Amount subscribed—common .....	4,000,000 00
Total paid in capital stock—common .....	4,000,000 00
Average amount paid in per mile of single main track (179.03 miles).....	22,342 62
Proportion of same for Ohio (22.06 miles).....	492,878 20

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For purpose of reorganization under an agreement for purchase of road—amount of common, \$4,000,000.00.

Stockholders, residents of Ohio, 108.

Amount of stock held by them June 30, 1881, \$2,832,200.00.

Agents authorized to transfer stock: Morton, Bliss & Co., 25 Nassau street, New York City.

Number of shares transferred within the year at such agencies, 54,969.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.*	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually outstanding.
Ind's & Cin. R. R. 1st mortgage...	Road from Indianap'lis to Ohio State line.....	Oct. 1, 1858...	Oct. 1, 1888...	per ct.		
Cin. & Ind. R. R. 1st mortgage ...	Road from Cincinnati to Indiana State line..	Dec. 1, 1862...	Dec. 1, 1892...	7	\$1,600,000 00	\$1,600,000 00
Cin. & Ind. R. R. 2d mortgage ...	Road from Cincinnati to Indiana State line..	Jan. 1, 1867...	Jan. 1, 1892...	7	500,000 00	499,000 00
Ind's, Cin. & Laf. R. R. 1st mortg..	Road from Cincinnati to Indiana State line..	Jan. 1, 1867...	Jan. 1, 1892...	7	500,000 00	499,000 00
Funded coupon..	Road from Ind. to Laf., and 2d mortgage on entire line from Laf. to Ohio State line .....	Feb. 1, 1867...	Feb. 1, 1897...	7	2,800,000 00	2,790,000 00
Equipm't bonds L., C. & L. R. R..	For coupons funded from C. & I. bonds of '67	Sept. 1, 1873..	Sept. 1, 1892	7	.....	34,800 00
C. I., St. L. & C. 1st consol'd mortg.	Mortgage on certain equipment .....	July 22, 1873	July 22, 1883	6	.....	68,000 00
Total.....	Whole line, Cin. to Laf.	May 1, 1880 ..	May 1, 1920...	.....	7,500,000 00	1,076,000 00
						<b>\$7,499,800 00</b>

Average amount per mile of single main track (179.03 miles).....	\$41,891 30
Proportion of same for Ohio (22.06 miles) .....	924,122 08
Decrease since June 30, 1880 .....	100 00
Amount of consolidated mortgage bonds in hands of Trustees for redemption of prior liens as they mature .....	\$6,424,000 00

## OTHER INDEBTEDNESS.

Contracted for equipment.....	\$268,892 96
All other debts, current credit balances, etc.	1,467,534 26

Total unfunded debt.....	\$1,736,427 22
Cash securities, debit balances, etc., available to payment	841,372 68

Net unfunded debt .....	\$895,054 54
-------------------------	--------------

Average amount per mile of single main track (179.03 miles).....	\$4,999 47	
Proportion of same for Ohio (22.06 miles) .....	110,288 31	
Increase since June 30, 1880.....	675,656 63	
		<hr/>
Total net debt liabilities .....		8,394,854 54
Average amount per mile of single main track (179.03 miles).....	\$46,890 77	
Proportion of same for Ohio (22.06 miles) .....	1,034,410 39	
Total of paid in stock and debt.....		12,394,854 54
Total average amount per mile (179.03 miles).....	\$69,233 39	
Proportion of same for Ohio (22.06 miles).....	1,527,288 59	

## COST OF ROAD EQUIPMENT, Etc.

Cannot classify. This company purchased the entire property, assuming debt of \$4,000,000 capital stock and \$7,500,000 of bonds, also certain claims of the receiver of the old company. The value of the property is taken at figures representing debt assumed; see balance sheet, included in this report, items "Construction" and "Equipment". This company has no data to furnish classified statement of construction.

Total permanent investment, construction and equipment account .....	\$12,337,951 94
Proportion for Ohio (22.06 miles).....	1,520,277 25
Average per mile (of single main track, 179.03 miles).....	68,915 56

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, La Fayette, Ind., to Indianapolis, Ind.	63.9 miles.	.....
Indianapolis to O.&M., crossing at Cinc.	109.0 miles.	18.6 miles.
Lawrenceburgh Junc. to Lawrenceburgh	2.4 miles.	.....

Total single main track.....	175.3 miles.	18.60 miles.
Double track, O. & M. and at Cincinnati, Ohio.....	.....	2.00 miles.
Aggregate of sidings and other tracks.....	53.8 miles.	13.63 miles.

Total length laid with rail computed as single track..	179.3 miles.	22.60 miles.
Laid with steel rail.....	176.9 miles.	22.60 miles.

Length in Ohio, distributed as follows:

County.	Main track.	Double track.	Sidings, etc.
Hamilton .....	18.6	2.0	13.63
Totals.....	18.6	2.0	13.63
Steel rail .....	All.	All.	None.

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Harrison Branch R'y.....	7.75 miles.	7.01 miles.
Cincinnati, La Fayette and Chicago R'y.....	56.30 "	None.
Fairland, Franklin and Martinsville R. R.....	38.30 "	None.
<hr/>		
Total single track .....	102.35 miles.	7.01 miles.
Double track.....	None.	None.
Sidings and other tracks: Harrison Branch, .34; C., L. & C., 7.60, and F., F. & M., 2.32 miles .....	10.56 miles.	.34 mile.
<hr/>		
Total .....	112.91 miles.	7.35 miles.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet, 8½ inches.
Grade—Maximum, per mile.....	75 feet.
Longest maximum, from Guilford to Sunman's.....	13.3 miles.
Aggregate length of maximum: Grade varies from 30 to 75 ft. per mile.	
Curvature—Shortest radius.....	287.9 feet.
Aggregate length of all radii... }	Maps and profiles of line incomplete; impossible to give the information.
Aggregate length of tangent... }	
Rail—Steel—On road.....	All.
Average weight per yard .....	56 pounds.
Ties—Average number per mile .....	2,800
Number laid during the year.....	51,000
Ballasted—On whole line .....	All.
In Ohio.....	All.
With stone and gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	4; greatest age.....	8 years; aggregate length.....	1,042 feet.
Stone arch .....	1; " .....	" .....	67 "
Total .....			1,109 feet.
Trestles—1; greatest age, 5 years; greatest height, 20 ft.; length, 80 ft.			
Length of shortest span of truss, 50 ft.; of longest, 158 ft.; greatest length of beams between points of support, if not trussed, 15 ft.			
Greatest space between cross ties upon bridges and trestles, 2 inches; length of ties, 9 feet.			
Number of track stringers: Stringers used in lengths of 15 feet.			
Are all bridges and trestles provided with guard rails? Yes.			
Do all bridges and trestles receive stated examinations? Yes.			
How often? Every three months.			
Are the examinations analytical, and are they made by a competent person? Yes.			
Tunnels—Brick, 1; length, 1,420 feet.			

FENCING—AVERAGE AND AGGREGATE COST.

There is about 107.5 miles of wire fence, costing on an average about 80 cts. per rod. The balance of road, where needed, is fenced with post and board fences, at cost of about \$1.20 per rod.

Length of road unfenced, and the reason therefor: Where turnpike runs along side of track.

CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Ohio and Mississippi connection track, at Cincinnati, Ohio.

Number of crossings of highways at grade in this State without protection.....	14
“ “ “ “ at which there are gates or flagmen..	1
“ “ “ over railroad.....	2

Number of highway bridges 18 feet above track ..... All.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

STATIONS AND TELEGRAPH.

TELEGRAPH LINE.

Miles on line of road operated.....	82.7; in Ohio, 10.1
Miles of same owned by railroad company .....	46.3; “ 4.5.

STATIONS.

Passenger and freight .....	64; in Ohio, 12.
Number with telegraph communication .....	36; “ 4
Number of same operated by railroad company .....	36; “ 4

ROLLING STOCK.

Locomotives .....	62; Average weight.....	66,000 lbs.
Express and baggage cars.....	14; “ .....	36,000 “
Passenger cars .....	52; “ .....	50,000 “
Parlor and sleeping cars .....	9; “ .....	55,000 “
Freight cars.....	2,675; “ .....	18,000 “
Other cars—postal.....	6; “ .....	43,000 “

Number of locomotives equipped with train brakes, 23.

Kind of brake: Westinghouse.

Number of cars equipped with train brakes: All cars in passenger service.

Kind: Westinghouse.

Number of passenger cars with “Miller Platform”: All.

Method of bridging between passenger cars, when two or more are run in trains: Miller Platform.

State methods of heating cars used for the transportation of passengers: Part by water base stoves in each end of car, with arrangement so that the fire would be extinguished should car be overturned, and part (the new cars) by Baker's patent heater.

Means of lighting same: Center and side lamps, a non-explosive oil being used.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	39 miles per hour.
Mail and accommodation, .....	25       "
Freight trains, .....	15       "

## EMPLOYEES.

Superintendent.....	1
Telegraph operators .....	36
Engineers.....	73
Baggagemen.....	24
Flagmen, switch-tenders and watchmen .....	82
Laborers.....	86
Clerks .....	77
Train dispatchers.....	4
Firemen .....	80
Wipers.....	26
Mechanics .....	310
Conductors.....	47
Brakemen.....	91
Station agents .....	65
Section men.....	496
Other employes .....	194
Total number employed by company in operating line.....	1692

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American Express Co.  
Adams Express Co.

Terms:

American Express Co.—From 1 mile to 100 miles,  $\frac{5}{10}$  cts. per cwt. From 101 miles to 200 miles,  $\frac{4}{10}$  cts. per cwt. From 201 to 254 miles,  $\frac{3}{10}$  cts. per cwt. From 1 to 254 miles,  $\frac{3}{10}$  cts. per cwt.

Adams Express Co.—\$3.50 per day services, and 40 cts. per 100 lbs.



## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.	Average life in Years.	Equipment and superstructure.	Average life in Years.
Locomotives—{ Passenger .....	15	Rails—Iron .....	5
{ Freight .....		Steel .....	10
Cars—Passenger .....	20	Frogs .....	1 to 3
Baggage .....	12	Ties—Oak .....	4
Box .....	12	Bridges—Wooden .....	10
Stock .....	10	Telegraph poles—Cedar.....	8
Coal .....	10	Fence posts .....	4 to 20
Flat .....	10		

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—	Highest.	Lowest.	Average.
For distances less than 8 miles .....	3 $\frac{3}{4}$ Cts.	1 Cts.	2.37 Cts.
Over 8 miles—First class.....	3 $\frac{3}{4}$	1	2.37
Second class.....	1 $\frac{3}{4}$	1 $\frac{1}{2}$	1.50
Emigrant.....	1 $\frac{1}{2}$	1	1.12
Excursion .....	2	$\frac{1}{2}$	1.25
Amount charged in addition to regular fares, in sleeping or other cars, run on your road: For seat, 25, 50, 75 cts., and \$1 for chair and parlor car seats.			

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

	Highest.	Lowest.	Average.
First class.....	2 Cts.	2 Cts.	2 Cts.
Second class.....	1.6	1.6	1.6
Third class.....	1.2	1.2	1.2
Fourth class.....	1	1	1
Fifth class .....	.6	.6	.6
Special class.....	.4	.4	.4

Rate per ton per mile on freight carried less than 30 miles:

First class.....	8	8
Second class.....	6	6
Third class.....	5	5
Fourth class.....	4	4
Fifth class.....	2	2
Special class.....	1	1

Rate per ton per mile on freight carried more than 30 miles: Same as "less than 30 miles."

Rate per ton per mile for—

Coal—Carried 10 miles or more .....	5 Cts.
Carried less than 10 miles .....	5
Pig iron—Carried 10 miles or more .....	5
Carried less than 10 miles .....	5

Limestone—Carried ten miles or more.....	6
Carried less than ten miles.....	6
Iron Ore—Carried ten miles or more.....	5
Carried less than ten miles.....	5
Undressed stone or lumber—Carried 10 miles or more .....	6
Carried less than 10 miles .....	6
Rate per 100 lbs. for loading and unloading: No charge made.	

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Fencing in Ohio—Miles of single fence built (average cost per rod, \$1).

Ballasting—main track: ballast kept on entire line.

Train mileage—Passenger.....	640,684	
Freight.....	688,361	
Mixed.....	25,864	
Construction .....	70,830	
Total .....		1,425,739
Car mileage—Passenger.....	217,006	
Express and baggage.....	1,007,104	
Freight—loaded.....	12,629,307	
empty.....	4,071,916	
Caboose .....	765,733	
Total.....		20,652,066
Fuel consumed—Wood, 1,000 cords; coal, 82,000 tons; total cost .....		\$198,561 01
Losses, etc., paid—On goods and baggage, for whole line.....	\$2,941 56	
For injuries in Ohio, fatal and non-fatal:		
To employes .....	47 35	
To others.....	181 50	
Total.....		\$228 85
For animals killed in Ohio:		
Horses, 3.....	\$110 00	
Cattle, 3.....	70 00	
Hogs, 15.....	63 50	
Total .....		\$243 50

## TRANSPORTATION.

Passengers—Number carried, local.....	609,720	
through.....	147,187	
Total.....		756,907
Average number carried in each car per trip.....		24.15
Average number of miles traveled by each.....		38.90
Total mileage, or number carried one mile.....		29,444,812

Average amount received for each.....	99 cents.
Average amount <i>per mile</i> received for each.....	2.55 cents.
Freight—Tons carried, local.....	300,105
through .....	955,894
<hr/>	
Total .....	1,255,999
Average tons in each loaded car per trip.....	7.40
Total movement, or tons carried one mile.....	128,962,930
Average amount received for each ton.....	\$1.24
Average amount <i>per mile</i> received for each ton.....	1.21 cts.
Average amount received for each ton through freight.....	\$1.16
Average amount received for each ton local freight.....	\$1.50

## Articles transported :

	Tons.	Per cent.
Coal.....	113,290	9.02
Stone, lime, sand, etc.....	36,428	2.90
Petroleum .....	16,000	1.27
Ores .....	210	.02
Pig and bloom iron.....	2,300	.18
Manufactured iron.....	50,658	4.03
Lumber and other forest products.....	139,107	11.08
Grain, flour, and other agricultural products.....	535,448	42.63
Live stock .....	82,047	6.54
Animal products.....	16,000	1.27
Manufactures, including agricultural implements.....	87,146	6.94
Merchandise .....	34,311	2.73
Miscellaneous .....	143,054	11.39

Total tonnage yielding revenue.....	1,255,999	100
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## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

Includes C., I., St. L. & C. R'y Co., 179.03 miles—F., F. & M. R. R., 38.30 miles, and 10 months of C., L. & C. R. R. Co., 56.30 miles.

## EARNINGS.

Passenger transportation—local .....	\$590,163 04
through .....	99,306 10
<hr/>	
Total .....	\$689,469 14
Freight transportation—local .....	\$791,423 17
through .....	718,018 40
<hr/>	
Total.....	1,509,441 57
Mail service.....	84,390 60
Express service.....	44,706 97
Other sources.....	37,049 75

Total earnings of line operated included in this report.....	\$2,365,058 03
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## OPERATING EXPENSES.

Maintenance of way and structure.....	\$348,559 40	
Maintenance of cars.....	140,990 67	
Motive power.....	294,873 39	
Conducting transportation.....	521,273 56	
General expenses:—(as follows)		
Taxes in Ohio.....	\$10,514 12	
Indiana.....	\$23,464 04	
	3,947 30	
	<hr/>	
	27,411 34	
	<hr/>	
		37,925 46
Salaries, &c.....	46,385 04	
Other expenses of operating.....	13,561 19	
	<hr/>	
Total .....		97,871 69
Total operating expenses, being 59.35 per cent. of earnings.....		1,403,568 71
Net earnings of 273.63 miles operated.....		961,489 32
Rentals paid for use of road, track, depots, equipment, etc.: Lake Erie & Western R. R., for rent of track between La Fayette and Templeton, Indiana.....		6,894 88
Net income over operating expenses and rents paid on 273.63 miles operated .....		954,594 44
Percentage of same to capital stock and debt (\$12,394,854.54).....		$7\frac{7}{100}\%$
Percentage of to total means applied to construction and equipment (\$12,337,951.94) .....		$7\frac{7}{100}\%$
Per mile of earnings.....	\$8,643 27; proportion for Ohio, 22.06 miles	190,670 54
operating expenses \$5,129 44.....		113,155 45
net earnings.....	\$3,488 63.....	76,959 18

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt (net) .....	\$675,656 63
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$556,449 05
Interest on floating debt included in operating expenses.	
Dividends, rate 6 per cent. per annum on general stock, 3 quarterly dividends of $4\frac{1}{2}$ per cent .....	180,000 00
Last dividend declared on general stock: Payable July 15, 1881, out of earnings to June 30, 1881.	
Bonds of company canceled.....	100 00
Purchase of railroad securities.....	208,189 88
Old claims charged to construction account .....	142,774 79
Additional equipment .....	542,169 96

## TRAIN ACCIDENTS—ENTIRE LINE.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1880.				
July 31	Manchester.....	Freight.....	Broken wheel.....	Sprained brakeman's ankle.
Aug. 12	Thorntown.....	".....	Jumping off trains.....	Foot mashed.
23	Law'bg Junct....	".....	Train run into by another freight.	
23	Newtown.....	".....	Switching and coupling cars.....	Foot mashed.
24	Whitestown.....	Passenger.....	Jumping off trains.....	Badly bruised.
30	Indianapolis.....	".....	Striking milk wagon.....	Wagon broken up.
7 Oct.	Lawrenceburg..	".....	Run into by another train.	Killed.
8	St. Paul.....	".....	Slipped and fell under cars.....	"
20	Greensburg.....	Light engine.....	Crossing track.....	Bruised a little.
26	Acton.....	Passenger.....	Walking track.....	
27		".....	Backed into by a switch engine.	
30	Indianapolis.....	Freight.....	Breaking in two.	
Nov. 6	Zionsville.....	".....	Misplaced switch.	
17	Thompson.....	Passenger.....	Fell off train, while in motion.	
17	Greensburg.....	".....	Running off track.	
15 Dec.	La Fayette.....	Freight.....	Run into by another train.	
12	Trautman's.....	Passenger.....	Striking milk wagon.....	Wagon broken up.
31	Cincinnati.....	".....		Wagon broken up.
1881.				
Jan'y 4	Cleves.....	Freight.....	Striking milk wagon.....	
14	Colfax.....	".....	Getting off track.	
20	Prescott.....	".....	Journal burned off.	
26	".....	".....	"	
27	South side.....	".....	"	
Feb. 10	Law'bg Junct....	Light engine.....	Striking wagon.....	Damaging wagon but little.
23	Culver's.....	Freight.....	Making coupling.....	Hand mashed.
27	Guilford.....	".....	Wheel broke.	
March 4	La Fayette.....	".....	Fell off train.....	Injured his head.
10	Boggs town.....	Mixed.....	Jumping off train.....	Not hurt much.
10	Greensburg.....	Freight.....	Breaking in two.....	Killing two men and injuring two more.
24	Montmorency.....	Passenger.....	Colliding.....	Bruising two men.
26	La Fayette.....	Freight.....	Journal burned off.	
27	Colfax.....	".....	Colliding by switching train.	
30				

31	April	9	Mayfo'er cros'g	Passenger.....	Striking wagon.....	Leg broken and badly bruised otherwise.
32	18	23	Lebanon .....	Freight.....	Cars running off end of switch.	
33	23	28	Indianapolis.....	Yard engine .....	Crossing tracks.....	Killed one man.
34			Colfax .....	Freight.....	Getting on train in motion.....	Bruised.
35	May	18	La Fayette .....	" .....	" .....	Killed one boy.
36		20	Ind'pls shops..	Yard engine .....	Crossing tracks.....	Killed one man.
37		21	Easton .....	Passenger.....	Cow on track threw engine over .....	"
38		22	La Fayette .....	Yard engine .....	Run into another switch engine.	
39		25	Law'bg Junct...	Passenger.....	Walking on track .....	
40	June	1	" .....	Freight.....	Journal burned off.	
41		23	St. Anne .....	Passenger.....	Collided with cars on main track.	Killed one man.

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$4,000,000 00
Mortgage bonds .....	7,499,800 00
Bills payable and loans .....	1,392,194 22
Due sundry persons (this amount includes coupon due July 1, 1881, for \$50,120, and dividend on stock, paya- ble July 15, 1881, \$60,000 .....	371,229 97
Profit and loss, account to June 30, 1881.....	275,947 68
Total.....	\$13,539,171 87

## ASSETS.

Construction and equipment .....	\$12,337,951 94
Material and supplies.....	64,585 42
Securities of railroad companies owned by this company .....	295,261 83
Due from sundry persons .....	245,405 57
Cash.....	595,967 11
Total.....	\$13,539,171 87

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1880. Dec. 10	"German lab'r"	Laborer.....	Man attempted to cross tracks .....	Killed.
1881. Feb. 8	W. H. Harrison...	Switchman ..	Coupling engine on to flat-car .....	"
Mar. 30	Geo. Blaney .....		Jumped off M. & C. train and fell under C., I., St. L. & C. train.....	"
Apr. 6	— Waldron.....		Getting on a train, and fell .....	Foot cut off.
June 19			Jumped off train while in motion.....	Collar bone br'k'n
Jan. 18		Supposed to be a tramp..	Stealing a ride on top of train.....	Killed.

## SUMMARY OF ACCIDENTS.

Persons killed—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion .....			1	1
Struck by bridge, chute or other obstruction .....			1	1
Coupling, or crushed between cars and engine .....		1		1
Lying, walking, falling, or being on track .....			1	1
Totals.....		1	3	4



Persons injured—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....	1	.....	.....	1
Falling between cars.....	.....	.....	1	1
Totals.....	1	.....	1	2

## RECAPITULATION.

Killed—Employees—from misconduct or want of caution.....	1
Others—At stations and highway crossings .....	2
Stealing rides.....	1
Total killed .....	4
Injured—Passengers—misconduct or want of caution.....	1
Others—Stealing rides.....	1
Total injured.....	2

## SUMMARY OF TRAIN ACCIDENTS.

Number accidents causing derailment of trains.....	4
accidents not resulting in derailment of train .....	26
collisions—Butting .....	6
Crossing .....	1
Rear .....	4
Total accidents.....	41
Causes of accidents effecting derailment of trains :	
Broken wheel .....	2
Cattle on track .....	1
Misplaced switch.....	1
Total .....	4
Causes of collisions :	
Cars on main track .....	1
Train breaking in two .....	2
Other causes .....	8
Total.....	11

Causes of accidents not resulting in derailment of trains:	
Other causes .....	26
<hr/>	
Total .....	26
Total derailments.....	4
Total collisions .....	11
Total accidents .....	41



*State of Ohio, County of Hamilton, ss.:*

M. E. Ingalls, President of the Cincinnati, Indianapolis, St. Louis and Chicago Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

M. E. INGALLS,  
President.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 31st day of August, A.D. 1881.

[SEAL.]

JAS. B. MATSON,  
Notary Public, Hamilton Co., O.

CINCINNATI AND MUSKINGUM VALLEY RAILWAY COMPANY.

Name of road : Cincinnati and Muskingum Valley Railway.  
By whom owned : Cincinnati and Muskingum Valley Railway Company.  
By whom operated : Pittsburgh, Cincinnati and St. Louis Railway Company.  
By what authority : Lease.  
Name of company making this report : Cincinnati and Muskingum Valley Railway Company.  
General office at Zanesville, Ohio.  
Principal office in Ohio at Zanesville, Ohio.  
Address correspondence relating to this report to W. F. Black, Secretary and Treasurer, at Zanesville, Ohio.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Thos. D. Messler .....	President.....	Pittsburgh, Pa.....	.....
Wm. F. Black .....	Secretary and Treasurer...	Zanesville, O .....	.....

DIRECTORS.

Name.	Residence.	Name.	Residence.
Thos. D. Messler .....	Pittsburgh, Pa.	M. Churchill .....	Zanesville, O.
Geo. B. Roberts .....	Philadelphia.	W. A. Graham .....	"
Charles Moran .....	New York.	D. S. Gray .....	Columbus, O.
Jas. Buckingham.....	Zanesville, O.		

CAPITAL STOCK.

CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$4,000,000 00
Number of shares—common.....	80,000
Par value of each—common .....	50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common.....	\$4,000,000 00
Amount subscribed—common .....	4,000,000 00
Total paid in capital stock—common.....	3,997,320 00
Average amount paid in per mile of single main track (148.45 miles) ...	\$26,927 05
Proportion of same for Ohio (148.45 miles) .....	All.
Stockholders, residents of Ohio, 116.	

Amount of stock held by them June 30, 1881, 1,372 shares, @ \$50 each, \$68,600.00.

Agents authorized to transfer stock: W. F. Black, Secretary and Treasurer, Zanesville, O.

Number of shares transferred within the year at such agencies, 2.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Am't actually issued.
1st mortg'e	1st mortgage on road between Dresden Junc. and Morrow..	Sept. 1, 1880	Jan. 1, 1901.	7%	\$1,500,000	\$1,500,000
Total.....					\$1,500,000	\$1,500,000

Average amount per mile of single main track (148.45 miles).....	\$10,104 41
Proportion of same for Ohio (148.45 miles).....	1,500,000 00

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc .....	\$698,665 73
Total unfunded debt.....	\$698,665 73
Cash securities, debit balances, etc., available to payment..	26,320 00
Net unfunded debt, excess of liabilities.....	\$672,345 73
Average amount per mile of single main track .....	\$4,529 11
Proportion of same for Ohio .....	672,345 73
Total net debt liabilities .....	\$2,172,345 73
Average amount per mile of single main track.....	\$14,633 52
Proportion of same for Ohio.....	2,172,345 73
Total of paid in stock and debt .....	\$6,169,665 73
Total average amount per mile .....	\$41,560 57
Proportion of same for Ohio.....	6,169,665 73

## COST OF ROAD EQUIPMENT, Etc.

Total for road and equipment .....	\$5,540,164 38
Total average amount per mile (of single main track 148.45 miles).....	37,322 58
Proportion of same for Ohio (148.45 miles) ∴ .....	5,540,164 38

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Dresden Junction to Morrow .....	148.45	148.45
Aggregate of sidings and other tracks .....	13.73	13.73

Total length laid with rail computed as single track..... 162.18 162.18

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Warren .....	9.81	.57	10.38
Clinton .....	23.59	1.52	25.11
Fayette.. .....	17.25	1.55	18.80
Pickaway .....	23.04	2.10	25.14
Fairfield .....	28 52	2.96	31.48
Perry .....	19.63	1.41	21.04
Muskingum .....	26.61	3.62	30.23
Totals .....	148.45	13.73	162.18

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt.....	\$79,085 09	
Lessee for rent of road—net earnings.....	25,914 91	
Total.....		\$105,000 00

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds—net.....	\$105,000 00
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## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$3,997,320 00
Funded debt.....	1,500,000 00
Interest on bonds.....	26,320 00
Accounts payable.....	124 39
Pittsburgh, Cincinnati and St. Louis R'y Co., lessee.....	672,221 34
Total .....	\$6,195,985 73

## ASSETS.

Roadway equipment, etc.....	\$5,540,164 38	
Material in hand of lessee.....	13,690 00	
Accounts receivable .....	4,338 67	
Moran Bros., N. Y., payment of interest.....	26,320 00	
Income account—balance.....	611,472 68	
	<hr/>	
Total.....		\$6,195,985 73

*State of Pennsylvania, County of Allegheny, ss.:*

THOS. D. MESSLER, President of the Cincinnati and Muskingum Valley Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

THOS. D. MESSLER,  
*President.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 10th day of September, A. D. 1881.

FRANK SEMPLE,  
*Notary Public.*

[SEAL.]

# PITTSBURGH, CINCINNATI AND ST. LOUIS RAILWAY COMPANY, OPERATING CINCINNATI AND MUSKINGUM VALLEY RAILWAY.

Name of road : Cincinnati and Muskingum Valley Railway.

By whom owned : Cincinnati and Muskingum Valley Railway Company.

By whom operated : Pittsburgh, Cincinnati and St. Louis Railway Company.

Name of company making this report : Pittsburgh, Cincinnati and St. Louis Railway Company.

General office at Pittsburgh, Pa.

Principal office in Ohio at Columbus.

Address correspondence relating to this report to J. W. Renner, Auditor, at Pittsburgh.

## NAME, TITLE, AND ADDRESS OF OFFICERS OF LESSEE COMPANY.

Name.	Office.	Address.	Salary.
George B. Roberts.....	President .....	Philadelphia, Pa .....	
J. N. McCullough .....	1st Vice President.....	Pittsburgh, Pa.....	
Wm. Thaw.....	2d " .....	" .....	
Thos. D. Messler.....	3d Vice Pres. and Compt..	" .....	
John E. Davidson .....	Assistant Comptroller .....	" .....	
M. C. Spencer .....	Treasurer.....	" .....	
John W. Renner .....	Auditor .....	" .....	
D. W. Caldwell.. .....	General Manager .....	" .....	
S. B. Liggett.....	Secretary .....	" .....	
S. W. White.....	Ass't Secretary.....	Philadelphia, Pa .....	
M. J. Beeker .....	Chief Engineer.....	Pittsburgh, Pa .....	
E. A. Ford .....	Gen. Pass'ger & Ticket Agt.	" .....	
Wm. Stewart.....	General Freight Agent.....	" .....	
F. H. Kingsbury .....	Ass't Gen'l Freight Agt....	Columbus, O.....	
J. N. McCullough .....	Executive Committee. }	Pittsburgh, Pa .....	
Wm. Thaw.....		" .....	
Thos. D. Messler .....		" .....	
John P. Green .....		Philadelphia, Pa.....	
Wm. H. Barnes.....		Pittsburgh, Pa.....	

## DIRECTORS OF LESSEE COMPANY.

Name.	Residence.	Name.	Residence.
Geo. B. Roberts .....	Phila., Pa.....	J. P. Netherill.....	Phila., Pa.
J. N. McCullough.....	Pittsburgh, Pa....	W. H. Barnes.....	Pittsburgh, Pa.
Wm. Thaw .....	" .....	D. S. Gray.....	Columbus, O.
Thos. D. Messler .....	" .....	R. Sherwood, Jr.....	Steubenville, O.
H. H. Houston .....	Phila., Pa.....	A. J. Cassatt.....	Phila., Pa.
Wistar Morris.....	" .....	John P. Green.....	" .....
J. N. DuBarry .....	" .....		



CHARACTERISTICS, ETC.

LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Morrow to Dresden Junction.....	148.45 miles.	148.45 miles.
Total single main track.....	148.45    "	148.45    "
Aggregate of sidings and other tracks .....	13.73    "	13.73    "
Total length laid with rail computed as single track...	162.18 miles.	162.18 miles.
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Warren .....	9 81	.57	10.38
Clinton .....	23.59	1.52	25.11
Fayette .....	17.25	1.55	18.80
Pickaway .....	23.04	2.10	25.14
Fairfield .....	28.52	2.96	31.48
Perry .....	19.63	1.41	21.04
Muskingum .....	26.61	3.62	30.23
Totals.....	148.45	13.73	162.18

GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 9 in.
Grade—Maximum, per mile.....	75 feet.
Longest maximum.....	800   "
Aggregate length of maximum .....	800   "
Curvature—Shortest radius .....	1,050   "
Aggregate length of shortest radius .....	770   "
Aggregate length of all curves.....	392,800   "
Aggregate length of tangent.....	120 <sup>3</sup> / <sub>8</sub> miles.
Rail—Iron—On road.....	162.02   "
Average weight per yard.....	56 & 60 lbs.
Steel—On road .....	.16 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile.....	2,640
Number laid during the year.....	40,265
Ballasted—On whole line .....	148.45 miles.
In Ohio .....	All.
With gravel.	

BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood.....	45;	greatest age....	21 years;	aggregate length, ft..	6,981
Iron.....	4;	"	7	"	306
Stone arch	2;	"	7	"	190
Total.....					7,477

Trestles—79; greatest age, 10 years; greatest height, 32 ft.; greatest length, 900 ft.; aggregate length, 6,624 ft.

Length of shortest span of truss, 48 ft.; of longest, 163 ft.; greatest length of beams between points of support, if not trussed, 20 ft

Greatest space between cross ties upon bridges and trestles, 16 inches; length of ties, 12 feet and 8 feet 6 in.

Number of track-stringers, 2 and 4.

Are all bridges and trestles provided with guard rails? No.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent person? Yes.

Tunnels—Stone, 1; length, 1,185 feet.

Fencing—Average and aggregate cost.

Whole line. In Ohio.

Number miles fencing, computed as single line .....	213	213
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Kind of fencing, as follows:

Post and board (average cost per rod, 75c.).....	100
Wire (average cost per rod, 77c.).....	4½
Hedge ..	2½

Length of road unfenced, and the reason therefor (23 miles through town do not require fencing; are fencing other as needed).....	84	84
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#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Toledo, Delphos & Burlington (N. G.) R. R. at Washington C. H., O.

Springfield Southern R'y at Washington C. H., O.

Scioto Valley R'y at Circleville.

Columbus & Hocking Valley R'y at Lancaster.

Newark, Somerset & Straitsville Div. of B. & O. R. R. at Junction City.

Ohio Central R'y at Bremen and New Lexington.

Central Ohio Div. of B. & O. R. R. at Zanesville.

Number of crossings of highways at grade in this State without protection, 107.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 3.

Number of crossings of highways over railroad, 6.

“ “ “ under railroad, 4.

Number of highway bridges 18 feet above track, 8.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? No.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated, 148.45; in Ohio, 148.45.

Miles of same owned by railroad company (jointly with W. U.), 148.45; in Ohio, 148.45.

## STATIONS.

Passenger and freight, 39; in Ohio, 39.

Number with telegraph communication, 20; in Ohio, 20.

Number of same operated by railroad company, 14; in Ohio, 14.

Is pay received for messages sent over line owned by railroad company? No.

## ROLLING STOCK.

Locomotives .....	12; average weight, lbs.....	98,000
Express and baggage cars .....	4; " " .....	38,000
Passenger cars .....	10; " " .....	37,362
Freight cars .....	359; " " .....	16,419
Other cars .....	5; " " .....	22,440

Number of locomotives equipped with train brakes, 5.

Kind of brake: Westinghouse air brake.

Number of cars equipped with train brakes, 15.

Kind: Westinghouse air brake.

Number of passenger cars with Miller Platform: None.

Method of bridging between passenger cars, when two or more are run in trains:

Janny Platform, except four cars, where a wood platform is used.

Are all cars on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Coal stoves, Dripps & Winslow patent.

Means of lighting same: Candles and mineral sperm oil lamps.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	24 miles per hour.
Mail and accommodation, .....	24 "
Freight trains, .....	9 "

## EMPLOYES.

Superintendents.....	1
Telegraph operators .....	18
Engineers.....	11
Baggagemen .....	6
Flagmen, switch-tenders and watchmen .....	5
Laborers.....	27
Clerks .....	7
Train dispatchers.....	1
Firemen .....	9
Wipers.....	8
Mechanics .....	85
Conductors.....	10
Brakemen.....	19
Station agents.....	16
Section men.....	91
Other employes.....	30

Total number employed by company in operating line..... 344

Proportion for Ohio ..... All.

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams express.

Terms: 40 per cent. of gross receipts (not including oyster business) and 70 per cent. of gross receipts of oyster traffic.

Special freight and transportation lines: The through freight cars of the Pennsylvania route, now owned by the Pennsylvania Company under the name of the Union Line and National Line. They carry the through freight at current rates, and are paid a commission for obtaining and doing the business.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in Years.
Locomotives .....	Passenger .....	18	Frogs .....		5
	Freight .....	15	Ties—Oak .....		7
Cars .....	Passenger .....	18	Bridges .....	Wooden—Covered 25 yrs., not cov'ed 10	
	Baggage .....	18		Iron—Not known...	
	Box .....	15		Trestles .....	8
	Stock .....	15	Telegraph poles...	Piling .....	10
	Coal .....	10		Cedar .....	15
	Flat .....	10	Fence posts .....	Other .....	10
Rails .....	Iron .....	6			7
	Steel—Not known...				
Joint fastenings .....		12			

## RATES OF TRANSPORTATION.

## PASSENGER.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles	.04 Cts.	.03 Cts.	
For distances over 8 miles—First class...	.03	.02	
Second class	.02	.01	} 02.667 Cts.
Emigrant ...	.02	.01	
Excursion...	.02	.01	

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

First class .....	.0088	.0025	} 00078
Second class .....	.0088	.0020	
Third class .....	.0075	.0015	
Fourth class .....	.0075	.0013	
Fifth class .....	.0063	.0011	
Special class .....	.0038	.0009	

## Rate per ton per mile on freight carried less than 30 miles :

First class .....	.17600	.0600	} 01558
Second class.....	.17600	.0600	
Third class .....	.15000	.0600	
Fourth class .....	.15000	.0560	
Fifth class.....	.12600	.0560	
Special class.....	.07600	.0380	

## Rate per ton per mile on freight carried more than 30 miles :

First class.....	.0520	.0500	} 01558
Second class.....	.0520	.0400	
Third class .....	.0460	.0300	
Fourth class.....	.0400	.0260	
Fifth class.....	.0400	.0220	
Special class.....	.0340	.0180	

## Rate per ton per mile for—

Coal—Carried ten miles or more.....	.0500	.0149	}
Carried less than ten miles.....	.0500	.0500	
Pig iron—Carried ten miles or more.....	.0500	.0200	
Carried less than ten miles.....	.0500	.0500	
Limestone—Carried ten miles or more.....	.0500	.0180	
Carried less than ten miles .....	.0500	.0500	
Iron ore—Carried ten miles or more .....	.0500	.0180	
Carried less than ten miles .....	.0500	.0500	
Undressed stone or lumber—			
Carried ten miles or more.....	.0500	.0180	
Carried less than ten miles.....	.0500	.0500	

## DOINGS OF THE YEAR ENDING JUNE 30TH.

## Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material. Wood, iron or stone.	Length—feet.
No. 23, west of Lancaster.....	Kellogg & Maurice	Iron, 1 span.....	93
No. 243, west of Lancaster ....	Low Howe truss...	Wood, 1 span .....	66
No. 36, west of Reed.....	Howe truss.....	Wood, 1 span .....	128
No. 45, west of Ellis.....	Howe truss.....	Wood, 2 spans.....	274
No. 45½, east of Dresden.....	Keystone Bridge Company.....	Iron, 2 spans .....	164

## Trestles built in Ohio—

Length filled and converted into embankment, 7; aggregate length, 390 feet.

Length filled and converted into bridge, 2; aggregate length, 269.

Fencing in Ohio—Miles of single fence rebuilt (average cost per rod, 78c.), .05.

Ballasting—Miles of main track reballasted, with gravel, in Ohio, 7.30.

Rail laid—Steel, 60 pounds per yard, miles of track, .07.

re-rolled iron, 60 pounds per yard, miles of track, 8.88.

Train mileage—Passenger .....	213,310	
Freight .....	184,235	
Work .....	2,360	
<hr/>		
Total .....		399,905
Car mileage—Passenger .....	438,627	
Express and baggage .....	162,130	
Freight—loaded .....	1,686,161	
empty .....	734,958	
Caboose .....	99,387	
Construction and other .....	9,440	
<hr/>		
Total .....		3,130,703
Fuel consumed—Wood, 423 cords; coal, 13,538 tons; total cost .....		\$19,429 24
Losses, etc., paid—On goods and baggage .....		304 05
For injuries in Ohio, fatal and non-fatal—		
to passengers .....	\$5 00	
to employes .....	167 05	
<hr/>		
Total .....		\$172 05
For animals killed in Ohio—		
3 horses .....	\$182 50	
1 mule .....	17 50	
5 cattle .....	82 50	
12 sheep .....	20 00	
9 hogs .....	42 50	
<hr/>		
Total .....		\$345 00
Amount claimed in litigation, etc., for injuries in Ohio to persons .....		25,000 00

## TRANSPORTATION.

Passengers—Number carried, local .....	210,713	
through .....	7,202	
<hr/>		
Total .....		217,915
Average number carried in each car per trip .....	10.10	
Average number of miles traveled by each .....	20.372	
Total mileage, or number carried one mile .....	4,439,463	
Average amount received for each .....	54.341 cents.	
Average amount <i>per mile</i> received for each .....	02.667 "	
Freight—Tons carried, local .....	190,883	
through .....	90,168	
<hr/>		
Total .....		281,051
Average tons in each loaded car per trip .....	9.12	
Average tons in each loaded car per mile .....	9.12	
Total movement, or tons carried one mile .....		15,384,028





## General expenses:

Taxes in Ohio.....	13,516 75
Salaries .....	3,111 28
Other general expenses of operating.....	2,465 77

Total .....	19,093 80
-------------	-----------

Total operating expenses, being 93.26 per cent. of earnings.....	\$358,369 70
Net earnings of 148.45 miles operated.....	25,914 91
Rentals paid (for use of road, track, depots, equipment), etc.: Advances for interest paid on bonds of Cincinnati and Muskingum Valley Railway Company; deficit to lessee.....	105,000 00
Net income over operating expenses and rents paid.....	79,085 09
Percentage of same to capital stock and debt, and percentage of to total means applied to construction, etc., should be reported by Lessor Company.	
Per mile of earnings, \$2,588.64; proportion for Ohio (148.45 miles).....	384,284 61
“ operating expenses, \$2,414.07 .....	358,369 70
“ net earnings, \$174.57 .....	25,914 91

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880				
2	Sept. 15	W. M. Griffin	Brakeman ...	Coupling cars .....	Hand crushed.
	Nov. 9	Jerry Cohen.	Passenger ...	Collision on railroad crossing.....	Scalp wound.
3	1881				
4	Jan. 19	Jas. Mulligan	Brakeman ...	Hoisting cars—jacks slipped out..	Broken leg.
	Mar. 5	Otto Mason.	“ .....	Coupling cars.....	Two fingers cut off.

## SUMMARY OF ACCIDENTS.

## PERSONS INJURED—CAUSES.

Passengers—Collision .....	1
Employees—Coupling, or caught between cars and engine.....	2
Miscellaneous.....	1
Total .....	4

## RECAPITULATION.

Injured—Passengers—from causes beyond their control .....	1
Employees—from causes beyond their control .....	1
misconduct or want of caution.....	2
Total injured.....	4

## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880 Nov. 9	Lancaster.....	Passenger.....	Collision on R. R. cross- [ing.]	Engine turned over on side and seriously damaged.
2	1881 Jan. 19	W. of Zanesville..	Freight.....	Broken axle .....	Three cars off the track. No serious damage.
3	4	Washington .....	" .....	Collision on crossing.....	Damaged engine tender slightly, and destroyed one box car.

## SUMMARY OF TRAIN ACCIDENTS.

Number:

Accidents not resulting in derailment of train.....	1
Collisions—crossing.....	2
Total accidents .....	3

Causes of accidents not resulting in derailment of trains:

Broken axle.....	1
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*State of Pennsylvania, County of Allegheny, ss.:*

Thos. D. Messler, 3rd Vice President of the Pittsburgh, Cincinnati and St. Louis Railway Company, lessee of Cincinnati and Muskingum Valley Railway, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement, of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

THOS. D. MESSLER,

*Third Vice President.*

Subscribed and sworn to before me, this 10th day of September, A. D. 1881.

FRANK SEMPLE,

[SEAL.]

*Notary Public.*

## CINCINNATI NORTHERN RAILWAY COMPANY.

Name of road: Cincinnati Northern Railway.

By whom owned: Cincinnati Northern Railway Company.

By whom operated: Cincinnati Northern Railway Company.

By what authority: Act of March 11, 1880.

Name of person making this report: M. A. McLaughlin, Auditor Cincinnati Northern Railway Company.

General office at Cincinnati, Ohio, except President, whose office is in New York City.

Principal office in Ohio at Cincinnati.

Address correspondence relating to this report to M. A. McLaughlin, Auditor Cincinnati Northern Railway, at 49 West Third street, Cincinnati, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

This company was organized under the provisions of the act entitled "an act supplementary to the Revised Statutes of Ohio, title two, chapters one and two, to enable purchasers of railroads at judicial sales to become incorporated," passed March 11, 1880.

The corporators of this company were Calvin S. Brice, Samuel Thomas, Chas. Foster, Ozro J. Dodds, Anthony D. Bullock, M. S. Forbes, John Ryan, and George Harper, who became the owners of all and singular of the rights and franchises of the road-bed, and the rights-of way, etc., of the Miami Valley Railway Company, under a deed from Abram Keever, Receiver and Master Commissioner, dated April 8, 1880.

Main line from Norwood to Lebanon, Ohio, was put in operation under construction department May 30, 1881. Length of line, 242 miles. No running arrangements with other roads. No branches or leased roads.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
John M. Corse.....	President.....	New York City.....	
Albert Netter.....	Vice President.....	Cincinnati.....	
B J. Bachman.....	Secretary.....	".....	
M. M. White.....	Treasurer.....	".....	
M. A. Laughlin.....	Auditor.....	".....	
C. W. Bradley.....	General Manager.....	".....	
Anderson and Hobby.....	Chief Engineers.....	".....	
M. A. McLaughlin.....	General Passenger Agent..	".....	
M. A. McLaughlin.....	General Freight Agent.....	".....	
M. A. McLaughlin.....	General Ticket Agent.....	".....	
John M. Corse.....	} Executive Committee..	New York City.....	
Albert Netter.....		Cincinnati.....	
M. M. White.....		".....	
C. T. Dickson.....		".....	
Ozro J. Dodds.....		".....	

## DIRECTORS.

Name.	Residence.	Name.	Residence.
John M. Corse.....	New York City..	Geo. Wm. Ballou.....	New York City.
Albert Netter.....	Cincinnati.....	J. S. Keck .....	Cincinnati.
M. M. White.....	" .....	Chas. Mayer.....	" .....
C. T. Dickson.....	" .....	J. M. Kinney.....	" .....
Ozro J. Dodds.....	" .....	J. H. Rhodes.....	" .....
Wm. Henry Davis.....	" .....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$1,000,000 00
Number of shares—common.....	20,000 00
Par value of each—common.....	50 00

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	Amount of preferred.
For construction on extension of line or branches.....	\$640,889 29
For purchase of lines.....	70,203 78
For rolling stock equipment.....	46,561 65
Total.....	\$758,654 72

Agents authorized to transfer stock: M. M. White, Treasurer, Cincinnati, Ohio.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage..	On whole line and branches..	Oct. 1, 1880 ...	Oct. 1, 1920	6%	\$1,000,000	\$1,000,000
Total .....					\$1,000,000	\$1,000,000

Average amount per mile of single main track (24.2 miles) main line constructed .....	\$24,691 33
Proportion of same for Ohio (8.15 miles) double track in course of construction .....	All.

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures for the year ending June 30, 1881.	Total expen- ditures to July 1, 1881.
Right of way .....	\$6,305 88	\$6,305 88
Civil engineering .....	3,290 83	3,290 83
Grading and masonry .....	14,597 66	14,597 66
Bridges .....	30,082 50	30,082 50
Timber and ties .....	2,578 79	2,578 79
Superstructure .....	26,867 79	26,867 79
Iron rails, chairs and spikes .....	93,859 63	93,859 63
Fencing .....	815 28	815 28
Passenger and freight stations.....	3,123 95	3,123 95
Engine and car houses.....	12 00	12 00
Other buildings and fixtures .....	3,952 43	3,952 43
Telegraph .....	2,269 47	2,269 47
Interest and discount .....	16,110 00	16,110 00
Contingent expenses.....	11,017 11	11,017 11
Total expenditures for construction.....	\$214,883 32	\$214,883 32

## ROAD ACQUIRED BY PURCHASE.

Miami Valley Railway, purchased for .....	\$71,203 78
Total expended for construction and purchase .....	286,087 10
Average cost per mile of road constructed (single main track, 24.2 miles)	11,821 78
Proportion of same for Ohio (24.2 miles), all.	

## COST OF EQUIPMENT OWNED BY COMPANY.

1 locomotive included in purchase account.	
4 locomotives .....	\$19,139 72
1 first-class passenger car .....	2,650 00
4 second class passenger cars.....	11,220 00
8 box freight cars.....	2,960 00
35 platform cars .....	7,603 00
1 baggage car .....	1,500 00
7 hand cars .....	427 90
2 caboose cars .....	704 00
6 track-laying cars.....	160 00
Total cost of railroad equipment owned by company .....	46,561 65
Average amount per mile (of single main track, 24.2 miles) .....	1,924 04
Proportion for Ohio, all.	
Total for road and equipment .....	332,648 75
Total average amount per mile (of single main track, 24.2 miles) .....	13,745 82
Proportion of same for Ohio, all.	

## CHARACTERISTICS, ETC.

## PROPOSED LINES.

From Court street, Cincinnati, to Norwood, 5.5 miles.

From Court street, Cincinnati, to Clifton, 2.65 miles.

Length graded, not laid with rail, none.

Proposed gauge, 36 inches.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Norwood to Lebanon .....	24.2 miles.	All.
Total single main track.....	24.2 miles.	All.
Aggregate of sidings and other tracks.....	1 mile.	All.
Total length laid with rail computed as single track.....	25.2 miles.	All.
Length in Ohio, distributed as follows:		

County.	Main track.
Hamilton .....	1.1 mi.
Butler.....	1.1 "
Warren .....	12.1 "
Total.....	24.2
Steel rail, none.	

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge—Three feet.	
Grade—Maximum, per mile.....	90 feet.
Longest maximum .....	3,400 "
Aggregate length of maximum.....	14,600 "
Curvature—Shortest radius.....	410 "
Aggregate length of shortest radius.....	410 "
Rail—Iron—On road.....	24.2 miles.
Average weight per yard.....	35 lbs.
Ties—Average number per mile.....	3,000
Number laid during the year.....	72,600
Ballasted—On whole line .....	24.2 miles.
In Ohio .....	24.2 "
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	3; greatest age .....	6 years; aggregate length.....	300 ft.
Trestles—11; greatest age, 1 year; greatest height, 30 ft.; greatest length, 350 feet; greatest length of beams between points of support, if not trussed, 16 ft.			

Greatest space between cross ties upon bridges and trestles, 6 inches ;  
length of ties, 8 ft.

Number of track stringers, two, 6 by 12 inches, and two, 12 by 16 inches.

Are all bridges and trestles provided with guard rails? All structures are  
so provided with 6 by 8-inch guards.

Do all bridges and trestles receive stated examinations? They do.

How often? Twice per month.

Are the examinations analytical, and are they made by a competent person? Yes, by the Engineer in charge, and Superintendent.

## STATIONS.

Passenger and freight in Ohio, 4.

## ROLLING STOCK.

Number of locomotives equipped with train brakes, 2.

Kind of brake: Westinghouse Automatic.

Number of cars equipped with train brakes, 6.

Kind: Westinghouse Automatic.

Number of passenger cars with "Miller Platform", 6.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Coal-stoves.

Means of lighting same: Lamps.

## SPEED OF TRAINS.

Express passenger, average rate, including stops ..... 12 miles per hour.

## EMPLOYES.

Engineers .....	4
Baggagemen.....	1
Laborers .....	3
Clerks .....	1
Firemen .....	4
Wipers.....	4
Mechanics .....	4
Conductors.....	2
Brakemen.....	6
Station agents .....	3
Section men.....	42
Other employes .....	40

Total number employed by company in operating line..... 114

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: United States Express Co.



## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Average
Fare charged per mile—For distances less than 8 miles.....	3c.	3c.
For distances over 8 miles—1st class.....	3c.	3c.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges were built by Miami Valley Railway Company prior to July 1, 1880.

Trestles built in Ohio, 11; aggregate length .....	1,450 feet.
Ballasting—Miles of main track ballasted with gravel.....	24.2
Rail laid—New iron, 35 lbs. per yard—miles of track .....	24.2
Train Mileage—Mixed .....	1,355
Construction .....	5,520
<b>Total.....</b>	<b>6,875</b>
Car Mileage—Passenger .....	1,355
Express and baggage .....	1,355
Freight—loaded.....	3,500
empty .....	2,700
Construction and other.....	44,000
<b>Total.....</b>	<b>52,910</b>
Fuel consumed—Wood, 34 cords; coal, 240 tons. Total cost .....	\$491 00

## TRANSPORTATION.

Passengers—Number carried, local.....	2,270
Average number carried in each car per trip.....	20
Average number of miles traveled by each.....	16
Total mileage, or number carried one mile.....	37,320
Average amount received for each .....	47c.
Average amount per mile received for each.....	3c.
Carried on construction train.	

## EARNINGS FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local.....	\$1,055 05
Freight transportation—local .....	228 43
Express service .....	93 79
<b>Total earnings of line operated included in this report.....</b>	<b>\$1,377 27</b>

*State of Ohio, County of Hamilton, ss.:*

M. A. McLaughlin, the Auditor of the Cincinnati Northern Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

M. A. McLAUGHLIN.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 30th day of November, A.D. 1881.

JAMES D. HENRY,

[SEAL.]

*Notary Public for Hamilton County, O.*

# CINCINNATI AND PORTSMOUTH RAILROAD COMPANY.

From June 30, 1880, to September 13, 1880.

Name of road: Cincinnati and Portsmouth Railroad.

By whom owned: Cincinnati and Portsmouth Railroad Company.

By whom operated: Joseph Clare, Receiver.

By what authority: Order of court.

Name of person making this report: J. Clare, Receiver Cincinnati and Portsmouth Railroad Company.

General office at 31½ West 3d street, Cincinnati, Ohio.

Principal office in Ohio at Cincinnati.

Address correspondence relating to this report to Joseph Clare, Receiver, at Cincinnati.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Cincinnati and Portsmouth Railroad was sold at judicial sale September 13, 1880, by the Sheriff of Clermont county, by order of the Court of Common Pleas of said county, to satisfy a judgment obtained by the holders of the first mortgage bonds, and was purchased by Henry Brachmann, with all its franchises and equipments for the sum of \$83,333, and on that date the Receiver was discharged so far as the control of said road was concerned.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
B. Kline .....	President .....	Amelia .....	.....
W. D. Mundell.....	Vice President.....	Cincinnati .....	.....
M. Simmons.....	Secretary .....	" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
B. Cline .....	Amelia, O.....	S. B. Miles.....	Georgetown.
W. D. Mundell.....	Mt. Washington	J. Clare .....	Resigned.
W. W. Duckwell .....	Mt. Carmel.....	A. L. Colter .....	Deceased.
Abram Hopper.....	Forestville.....	W. H. Cerbly.....	"
J. M. Goodwin .....	Bethel, O.....		

## CAPITAL STOCK.

Capital stock authorized by law—Amount, common.....	\$500,000 00
Par value of each, common.....	50 00
Capital stock—Amount subscribed, common and donations conditional	173,500 00
Total paid in capital stock, common and donations.....	94,835 82
Average amount paid in per mile of single main track (20 miles) .....	4,741 74
Stockholders, residents of Ohio, and donators, 650.	
Amount of stock held by them June 30, 1881.....	32,500 00
Agents authorized to transfer stock: None.	
Number of shares transferred within the year at such agencies: None.	

## FUNDED DEBT.

1. Kind of bond or oblig'tions.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of in- terest.	6. Amount of author- ized issue.	7. Amount actually issued.
1st mortgage.	Mortgage .....	July 1877	July 1897	7 %	\$240,000 00	\$5,000 00
Total .....						

As collateral .....	\$205,400 00
Average amount per mile of single main track (20 miles).....	\$210,400 00

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$162,614 61
Net unfunded debt.....	\$162,614 61
Average amount per mile of single main track .....	\$8,130 73
Total net debt liabilities.....	167,714 61
Total of paid in stock and debt.....	262,550 43
Proportion of same for Ohio.....	All.

## COST OF ROAD, EQUIPMENT, Etc.

Construction account.		Total expenditures to July 1, 1881.
Right of way.....		\$8,724 44
Civil engineering.....		13,292 56
Grading and masonry.....		35,942 62
Bridges.....		13,056 58
Timber and ties.....		18,272 07
Superstructure.....		15,538 32
Iron rails, chairs and spikes.....		23,114 41
Passenger and freight stations.....		517 00
Engine and car houses.....		1,845 56
Other buildings and fixtures.....		1,666 59
Telegraph.....		16 00
Interest and discount.....		12,449 00
Real estate.....		3,006 50
Not distributed.....		85,931 96
Total expenditures for construction.....		\$233,373 61

Total expended for construction and purchase ..... \$233,373 61  
Average cost per mile of road constructed (single main track 20.4 and 16 miles grading, &c.): Cannot make the distinction between finished and that not.

## COST OF EQUIPMENT OWNED BY COMPANY.

Total cost of railroad equipment owned by company..... \$29,176 82  
Average amount per mile (of single main track, 20 miles), \$1,458.  
Total for road and equipment..... 262,550 43  
Proportion of same for Ohio (20.4 miles completed 16 graded and tied.)  
Total permanent investment..... 262,550 43

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Columbia to Portsmouth; 100 miles.  
Length graded, not laid with rail, 16 miles; Amelia to Hamersville, Brown county.  
Proposed gauge, 36 inches.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Columbia to Amelia.....	20.4 miles.	All.
Aggregate of sidings and other tracks.....	11 "	

Total length laid with rail computed as single track..... 21.5 miles.

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Hamilton .....	10.4	.7	11.1
Clermont .....	10	.4	10.4
Total .....	20.4	1.1	21.5

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	3 feet.
Grade—Maximum, per mile.....	132 "
Longest maximum .....	1,500 "
Aggregate length of maximum .....	1,500 "
Curvature—Shortest radius .....	573 "
Aggregate length of shortest radius.....	1,000 "
Rail—Iron—On road .....	20.4 miles.
Average weight per yard.....	35 & 40 lbs.
Ties—Average number per mile .....	2,640
Ballasted—On whole line .....	14 miles.

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Combination.....	1; greatest age.....	3 years; length.....	508 ft.
Trestles—28; greatest age, 3 years; greatest height, 51 feet; greatest length, 1,930 ft.			
Length of shortest span of truss, 30 feet; of longest, 51 feet.			
Greatest space between cross ties upon bridges and trestles, 12 inches;			
length of ties, 6 and 12 feet.			
Number of track stringers, 2 and 4.			
Are all bridges and trestles provided with guard rails? Yes.			
Do all bridges and trestles receive stated examinations? Yes.			
How often? Weekly.			
Are the examinations analytical, and are they made by a competent person? Yes.			

## CROSSINGS.

What railroads cross your road either over or under your grade in this State, and where? New Richmond Branch of Cincinnati Eastern, at Dry Run.	
Number of crossings of highways at grade in this State without protection.....	14
" " " " at which there are gates or flagmen: None.	
" " " under railroad.....	1
" highway bridges 18 feet above track .....	None.
" " " less than 18 feet above track.....	"
Do all trains stop at railroad crossings as required by law? Yes.	
Are flagmen stationed at each? No.	

## STATIONS AND TELEGRAPH.

## STATIONS.

Passenger and freight .....	9; in Ohio..
Number with telegraph communication .....	2; " ...
Number of same operated by railroad company.....	2; " ... Partly.

## ROLLING STOCK.

Locomotives .....	2; Average weight.....	36,000 lbs.
Express and baggage cars.....	1; " .....	14,000 "
Passenger cars .....	3; " .....	16,000 "
Freight cars .....	22; " .....	8,800 "
Other cars .....	" .....	6,250 "

Number of locomotives equipped with train brakes, 2.

Kind of brake: Westinghouse.

Number of cars equipped with train brakes, 4.

Kind: Westinghouse.

Number of passenger cars with "Miller Platform", 3.

Method of bridging between passenger cars, when two or more are run in trains:

Miller Platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Coal stoves.

Means of lighting same: Candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	16 miles per hour.
Mail and accommodation .....	14 " "
Freight trains .....	12 " "

## EMPLOYES.

Superintendents .....	1
Clerks .....	1
Engineers .....	2
Firemen .....	2
Baggagemen .....	1
Wipers .....	2
Station agents.....	9
Flagmen, switch-tenders and watchmen .....	2
Section men.....	18*
Laborers .....	18 <sup>o</sup>
Other employes.....	1
Proportion for Ohio.....	All.

Total number employed by company in operating line..... 31

\*Same.



## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.	Average life in years.	Equipment and superstructure.	Average life in years.
Locomotives—Passenger.....	3	Frogs.....	3
Cars—Box.....	3	Ties—Pine .....	3
Joint fastenings.....	3	Bridges—Trestles .....	3

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile :	Highest.	Lowest.	Average.
For distances less than 8 miles.....	4 Cts.	.7 Cts.	Cts.
Over 8 miles—First class.....	3	.7	

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

First class.....	.8	.8
Second class .....	.7	.7
Third class.....	.6	.6
Fourth class.....	.5	.5

Rate per ton per mile on freight carried less than 30 miles :

First class .....	5	.5	.5
Special class.....	4		.4

Rate per ton per mile for—

Coal—Carried ten miles or more.....	4	4
Limestone—Carried ten miles or more .....	4	4
Undressed stone or lumber—Carried ten miles or more .....	4	4

## DOINGS OF THE YEAR UP TO SEPT. 13TH.

Train mileage—Passenger.....	2,880	
Mixed.....	1,280	
Total.....		4,160
Car mileage—Passenger.....	7,076	
Express and baggage.....	2,480	
Total .....		9,556
Fuel consumed—Wood, 4 cords; coal, 142 tons. Total cost.....		\$322 07

## TRANSPORTATION.

Passengers—Number carried.....	7,241
Average amount received for each.....	40.29c.
Average amount <i>per mile</i> received for each.....	2.5c.
Freight—Tons carried.....	279
Average amount received for each ton.....	97.5c.

Articles transported :	Tons.	Per cent.
Coal .....	160	58
Lumber and other forest products.....	95	34
Manufactures, including agricultural implements.....	12	5
Merchandise.....	4	1
Miscellaneous .....	8	2
Total tonnage yielding revenue.....		100

## EARNINGS, OPERATING EXPENSES, Etc., JULY 1, 1880, TO SEPT. 13, 1880.

## EARNINGS.

Passenger transportation .....	\$2,917 84
Freight transportation .....	271 78
Mail service .....	392 11
Total earnings of line operated included in this report.....	\$3,581 73

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$1,022 86
Conducting transportation .....	1,479 78
General expenses, as follows:	
Taxes in Ohio (paid by purchaser of C. & P. R. R.).....	455 24
Total operating expenses, being 72.5 per cent. of earnings.....	\$2,957 88
Net income over operating expenses and rents paid .....	623 85

## CONDENSED GENERAL BALANCE SHEET JULY 1, 1881.

## LIABILITIES.

Account of stock .....	\$94,835 82
Account of bonds .....	5,100 00
Bills payable.....	162,614 61
Balance .....	80,799 01
Total.....	\$343,349 44

## ASSETS.

Unpaid conditional stock .....	\$78,664 18
Railway and equipment .....	262,550 43
Earnings .....	2,134 83

Total..... \$343,349 44  
 There are other claims not recognized by the company.

*State of Ohio, County of Hamilton, ss.:*

Joseph Clare, Receiver of the Cincinnati and Portsmouth Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of September, A. D. 1880, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

JOSEPH CLARE,

*Receiver C. & P. R. R.*

Subscribed and sworn to before me this 14th day of September, A. D. 1881.

[SEAL.]

WILLIAM B. CROUCH,

*Notary Public in and for Hamilton county, O.*

CINCINNATI, RICHMOND AND CHICAGO RAILROAD COMPANY,  
AND CINCINNATI, HAMILTON AND DAYTON RAILROAD  
COMPANY OPERATING.

Name of road: Cincinnati, Richmond and Chicago Railroad.

By whom owned: The stockholders.

By whom operated: Cincinnati, Hamilton and Dayton Railroad Company.

By what authority: Lease.

Name of company making this report: Cincinnati, Richmond and Chicago Railroad Company.

General office at Cincinnati, O.

Principal office in Ohio at Hamilton, O.

Address correspondence relating to this report to F. H. Short, Secretary and Treasurer, Cincinnati, O.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. H. Devereaux .....	President .....	Cleveland .....	.....
M. M. White .....	Vice President.....	Cincinnati .....	.....
F. H. Short.....	Secretary and Treasurer ...	" .....	.....
Albert Griggs .....	Superintendent .....	" .....	.....
A. H. McLeod.....	General Freight Agent .....	" .....	.....
Samuel Stevenson .....	General Ticket Agent .....	" .....	.....

DIRECTORS.

Name.	Residence.	Name.	Residence.
J. H. Devereaux.....	Cleveland, O.	H. D. Huntington.....	Cincinnati, O.
Stevenson Burke .....	" .....	L. Williams .....	" .....
John Carlisle .....	Cincinnati, O.	Wm. Beckett .....	Hamilton, O.
M. M. White .....	" .....	E. W. McGuire .....	Richmond, Ind.
F. H. Short.....	" .....		

CAPITAL STOCK.

Capital stock authorized by law—Amount, common.....	\$382,600 00
Number of shares, common .....	7,652
Par value of each, common.....	\$50 00

Capital stock authorized by vote of company—common .....	382,600 00
Amount subscribed, common .....	382,600 00
Total paid in capital stock—common .....	382,600 00
Average amount paid in per mile of single main track (35.55 miles).....	10,623 06
Proportion of same for Ohio (35.55 miles) .....	382,600 00
Capital stock issued, and on what account, as follows: The stock was issued under scheme of foreclosure and reorganization.	
Stockholders, residents of Ohio, 16.	
Amount of stock held by them June 30, 1881.....	\$382,600 00
Agents authorized to transfer stock: F. H. Short, Secretary and Treasurer, Cincinnati, Ohio.	

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Bond .....	Mortgage.....	May 1, 1866 ..	July 1, 1885....	7	\$560,000 00	\$551,000 00
" .....	" .....	Mar. 1, 1869..	" 1889....	7	65,000 00	65,000 00
Total.....	.....	.....	.....	.....	\$625,000 00	\$616,000 00

Average amount per mile of single main track (35.55 miles), \$17,328.

Proportion of same for Ohio (35.55 miles), \$616,000.

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$9,450 00	
Total unfunded debt.....	9,450 00	
Cash securities, debit balances, etc., available to payment .....	7,242 91	
Net unfunded debt .....		\$2,207 09
Average amount per mile of single main track .....	\$2,207 09	
Decrease since June 30, 1880 .....	3,056 85	
Total net debt liabilities.....		618,207 09
Average amount per mile of single main track .....	\$17,391 56	
Proportion of same for Ohio.....	618,207 09	
Total of paid in stock and debt.....		1,000,807 09
Total average amount per mile .....	\$28,153 90	
Proportion of same for Ohio.....	1,000,807 09	

## COST OF ROAD EQUIPMENT, ETC.

Total expenditures for construction and real estate.....	\$827,433 29
--	--------------

## ROAD ACQUIRED BY PURCHASE.

Total expended for construction and purchase .....	\$827,433 29
Average cost per mile of road constructed (single main track, 35.55 miles) .....	23,275 19
Average cost per mile of road owned by company (single main track, 35.55 miles) .....	23,275 19
Proportion of same for Ohio (35.55 miles).....	827,433 29

## COST OF EQUIPMENT OWNED BY COMPANY.

3 locomotives; 2 passenger cars; 83 box freight cars; 83 platform cars; 3 baggage cars; 18 coal cars; 6 section cars; 7 hand cars; 1 caboose car; 22 stock cars. This shows the amount of equipment at date. The cost of each class cannot be given separately.

Total cost of railroad equipments owned by company.....	\$184,551 98
Average amount per mile (of single main track, 35.55 miles).....	5,191 62
Proportion for Ohio (35.55 miles).....	184,551 98
Total for road and equipment .....	1,011,985 27
Total average amount per mile (of single main track, 35.55 miles) .....	28,466 81
Proportion of same for Ohio (35.55 miles).....	1,011,985 27

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Hamilton to Indiana State Line .....	44.500	35.550
Total single main track .....	44.500	35.550
Aggregate of sidings and other tracks.....		2.428
Total length laid with rail computed as single track .....		37.978
Laid with steel rail .....	15	15
Length in Ohio, distributed as follows :		

County.	Main track.	Sidings, etc.	Total.
Butler .....	12.030	7.98	12.828
Preble .....	23.520	16.30	25.150
Totals .....	35.550	24.28	37.978

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Cincinnati, Hamilton and Dayton Railroad.....	2.97	2.97
Richmond and Miami Railroad.....	5.98	
Total single track.....	8.95	2.97

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Grade—Maximum, per mile.....	60 feet.
Curvature—Shortest radius .....	1,910 "
Aggregate length of shortest radius.....	3,009 "
Aggregate length of all radii .....	45,619 "
Aggregate length of tangent .....	35.36 miles.
Rail—Iron—On road (side track 24.28) main.....	23.55 "
Average weight per yard (originally).....	60 lbs.
Steel—On road.....	12 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile .....	2 640
Ballasted—On whole line.....	41.53 miles.
In Ohio.....	35.55 "
With gravel.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 23 ; greatest age, 9 years ; aggregate length.....	2,418 feet.
Total .....	2,418
Trestles—Length of shortest span of truss, 31 feet ; of longest, 143 ; greatest length of beams between points of support, if not trussed, 20 feet.	
Greatest space between cross ties upon bridges and trestles, 2 inches ; length of ties, 10 feet.	
Number of track stringers, 126.	
Are all bridges and trestles provided with guard rails? Yes.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Average two months.	
Are the examinations analytical, and are they made by a competent person? Yes.	

## FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line : Road has all been fenced once.

## CROSSINGS.

Number of crossings of highways under railroad, 3.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated.....	44½ ; in Ohio, 35.55
Miles of same owned by railroad company.....	44½ ; " 35.55

## STATIONS.

Passenger and freight .....	15 ; in Ohio, 12
Number with telegraph communication .....	6 ; " 4
Number of same operated by railroad company .....	6 ; " 4
Is pay received for messages sent over line owned by railroad company? Yes.	



## ROLLING STOCK.

Locomotives.....	3; Average weight, lbs.....	68,310
Express and baggage cars.....	3; " " .....	36,000
Passenger cars.....	2; " " .....	35,000
Freight cars.....	206; " " .....	18,000
Other cars .....	1; " " .....	17,000

Number of locomotives equipped with train brakes, 2.

Kind of brake: Westinghouse air.

Number of cars equipped with train brakes, 5.

Kind: Westinghouse air.

Number of passenger cars with "Miller Platform," 2.

Method of bridging between passenger cars, when two or more are run in trains:

Miller Platform and Buffer.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Wood or coal.

Means of lighting same: Oil and candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation, " .....	25 "
Freight trains, " .....	10 "

## EMPLOYES.

Superintendents.....	1
Telegraph operators .....	3
Engineers.....	7
Baggagemen.....	3
Flagmen, switch-tenders and watchmen.....	2
Clerks .....	2
Train dispatchers.....	3
Firemen .....	7
Wipers.....	2
Mechanics .....	4
Conductors.....	6
Brakemen .....	11
Station agents.....	8
Section men.....	28
Other employees .....	2
	<hr/>
Proportion for Ohio .....	89
	69

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American and United States.

Terms: American, \$60 per day for 4,000 lbs. daily, and 16 cts. per 100 lbs. excess.

United States, 25 cts. per 100 lbs. between Cincinnati and Richmond.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

These can only be given as estimates, subject to usage, quality, location, etc.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles .....	10c.	3c.	Est'd 3½c.
For distances over 8 mi.—1st class...	3c.	3c.	3c.
Excursion	2c.	½c.	Est'd 1c.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class .....	10 00 Cts.	1.50 Cts.	5.00 Cts.
Second class .....	8.00	1.25	4.50
Third class .....	6.00	1.00	3.50
Fourth class .....	5.00	0.75	2.50
Fifth class .....	4.00	0.50	2.00
Special class .....	2.50	0.40	1.50

Rate per ton per mile on freight carried less than 30 miles :

First class .....	30.00	5.17	17.50
Second class .....	30.00	4.14	17.00
Third class .....	30.00	3.45	15.00
Fourth class .....	30.00	3.10	15.00
Fifth class.....	25.00	2.76	14.00
Special class .....	25.00	2.58	13.00

Rate per ton per mile on freight carried more than 30 miles:

First class .....	6.13	2.25	4.00
Second class .....	5.16	1.75	3.50
Third class .....	3.87	1.50	2.50
Fourth class.....	3.23	1.00	2.00
Fifth class.....	3.00	0.75	2.00
Special class .....	2.42	0.70	1.50

Rate per ton per mile for—

Coal—Carried ten miles or more.....	5.00	0.50	1.25
Carried less than ten miles.....	25.00	5.½	10.00
Pig iron—Carried 10 miles or more .....	5.00	0.65	1.50
Carried less than 10 miles .....	25.00	5.½	10.00
Limestone—Carried 10 miles or more .....	5.00	0.65	1.50
Carried less than 10 miles .....	25.00	5.½	10.00
Iron ore—Carried 10 miles or more.....	5.00	0.65	1.50
Carried less than 10 miles.....	25.00	5.½	10.00
Undressed stone or lumber—Carried 10 miles or more ...	5.00	0.75	1.50
Carried less than 10 miles... ..	25.00	5.½	10.00

## Rate per 100 lbs. for loading:

First class .....	4.25	3.75	4.00
Second class .....	3.00	3.00	3.00
Third class .....	1.50	1.50	1.50
Fourth class .....	1.50	1.50	1.50
Fifth class .....	1.50	1.50	1.50
Special class .....	1.25	1.25	1.25

## Rate per 100 lbs. for unloading:

First class .....	4.25	3.75	4.00
Second class .....	3.00	3.00	3.00
Third class .....	1.50	1.50	1.50
Fourth class .....	1.50	1.50	1.50
Fifth class .....	1.50	1.50	1.50
Special class .....	1.25	1.25	1.25

## DOINGS OF THE YEAR ENDING JUNE 30.

## Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length—feet.
No. 15, over Seven Mile Creek	Howe truss .....	Wood .....	143
No. 16, " "	" .....	" .....	143

Ballasting—Miles of main track ballasted .....	7½	
Rail laid—Steel—miles of track .....	7½	
Train mileage—Passenger.....	90,292	
Freight.....	59,986	
Mixed.....	6,310	
Total.....		156,588
Car mileage—Passenger.....	238,232	
Express and baggage .....	68,300	
Freight—loaded .....	823,450	
empty .....	208,976	
Caboose.....	58,029	
Total .....		1,396,987
Fuel consumed—Wood, 600½ cords; coal, 658½ tons. Total cost .....		\$16,072 74
Losses, etc., paid—On goods and baggage .....		1,444 54
For injuries in Ohio, fatal and non-fatal:		
To employes .....		518 80
For animals killed in Ohio:		
Two horses .....	\$100 00	
One mule .....	40 00	
Six cattle .....	95 00	
Total .....		235 00

## TRANSPORTATION.

Passengers—Number carried, local .....	99,273	
through.....	22,859	
Total.....		112,132
Average number carried in each car per trip.....		16.29
Average number of miles traveled by each.....		28.51
Total mileage, or number carried one mile.....		3,197,649
Average amount received for each.....		68.5 cts.
Average amount <i>per mile</i> received for each .....		2.401 cts.
Freight—Tons carried, local.....	79,064	
through.....	118,311	
Total .....		197,375
Average tons in each loaded car per trip.....		9.45
Average tons in each loaded car per mile.....		9.82
Total movement, or tons carried one mile.....		8,087,197
Average amount received for each ton.....		69 cts.
Average amount <i>per mile</i> received for each ton .....		1.681 cts.
Average cost per ton freight per mile .....	No means of ascertaining.	
Average amount received for each ton through freight.....		58½
Average amount received for each ton local freight.....		85.
Average cost each ton through freight.....	No means of ascertaining.	
Average cost each ton local freight .....	" "	
<b>Articles transported:</b>		
	Tons.	Per cent.
Coal .....	20,050	10.16
Stone, lime, sand, etc.,.....	6,339	3.21
Petroleum .....	1,834	0.93
Ores .....	1,578	0.80
Pig and bloom iron.....	13,412	6.80
Manufactured iron.....	5,766	2.92
Lumber and other forest products.....	46,317	23.46
Grain, flour, and other agricultural products .....	32,261	16.35
Live stock.....	19,456	9.85
Animal products.....	5,969	3.03
Manufactures, including agricultural implements.....	5,051	2.55
Merchandise .....	38,597	19.56
Miscellaneous ..	745	0.38
Total tonnage yielding revenue.....	197,375	100
Supplies for company's use.....	394	

EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

### EARNINGS.

Passenger transportation—local.....	\$54,947 06	
through.....	21,832 82	
Total.....		\$76,779 88
Freight transportation—local .....	\$67,097 64	
through.....	68,899 80	
Total.....		135,997 44
Mail service.....		3,818 54
Express service.....		8,998 94
Other sources.....		519 42
Total earnings of line operated included in this report.....		\$226,114 22

OPERATING EXPENSES.

Maintenance of way and structures.....	\$53,663 74	
Maintenance of cars.....	41,106 78	
Motive power .....	37,521 34	
Conducting transportation.....	28,190 39	
General expenses, as follows:		
Taxes in Ohio.....	\$2,291 00	
Indiana.....	171 65	
Salaries .....	5,938 45	
Other general expenses of operating...	2,882 27	
	<hr/>	
	11,283 37	
Total operating expenses.....		171,765 62
		<hr/>
Net earnings .....		\$54,348 60
Rentals paid for use of road, track, depots, equipment, etc.:		
C., H. & D. R. R.....	\$10,000 00	
Richmond and Miami R. R.....	8,000 00	
	<hr/>	
		18,000 00
		<hr/>
		\$36,348 60
Percentage of same to capital stock and debt .....	5.43	
Percentage of to total means applied to construction, etc .....	5.37	
Per mile of earnings.....	\$5,081 22; Proport'n for O. (35.55 miles)	180,637 37
operating expenses	3,859 90; " " "	137,249 44
net earnings .....	1,221 32; " " "	43,387 93

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$43,120 00	
Premiums and commissions for paying coupons .....	69 63	
	<u>          </u>	\$43,189 63

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$382,600 00	
First mortgage .....	560,000 00	
Second mortgage .....	65,000 00	
Unpaid coupons.....	9,450 00	
Profit and loss.....	2,178 18	
		\$1,019,228 18

## ASSETS.

Construction .....	\$826,733 29	
Equipment.. .....	184,551 98	
Real estate.....	700 00	
Cin., Ham. and Dayton R. R. Co.....	7,242 91	
		\$1,019,228 18

## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	Nov. 3....	New River.....	Freight.....	Switch open.....	Engine and car derailed.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	1
Causes of accidents effecting derailment of trains:	
Misplaced switch.....	1

*State of Ohio, county of Cuyahoga, ss.:*

Lewis Williams, General Manager of the Cincinnati, Richmond and Chicago Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

LEWIS WILLIAMS,

*Gen'l Manager.*

Subscribed and sworn to before me, this 30th day of August, A. D. 1881.

J. T. WANN,

[SEAL.]

*Notary Public.*

CINCINNATI, SANDUSKY AND CLEVELAND RAILROAD COM-  
PANY, AND CINCINNATI, SANDUSKY AND CLEVELAND  
RAILROAD COMPANY OPERATING COLUMBUS,  
SPRINGFIELD AND CINCINNATI RAILROAD.

From June 30, 1880, to May 1, 1881.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. S. Farlow .....	President .....	Boston, Mass.....	\$10,000
N. W. Pierce .....	Vice President .....	" .....	
J. L. Moore .....	Secretary and Treasurer ...	Sandusky .....	3,000
L. H. Lewis .....	Auditor.....	" .....	1,500
D. W. C. Brown .....	Gen. Man. and Gen. Sup't..	" .....	4,000
F. Woodbridge .....	Chief Engineer.....	" .....	1,500
O. B. Lockwood .....	General Freight Agent .....	" .....	2,400
H. M. Brown.....	General Ticket Agent.....	" .....	2,400
J. S. Farlow .....	Ex officio Executive Committee.	.....	.....
N. W. Pierce .....		.....	.....
I. D. Farnsworth .....		.....	.....
Levi O. Wade .....		.....	.....
Total salary .....	.....	.....	.....

DIRECTORS.

Name.	Residence.	Name.	Residence.
J. S. Farlow.....	Boston .....	J. H. Thomas.....	Springfield.
I. D. Farnsworth .....	" .....	J. D. Chamberlin .....	Sandusky.
N. W. Pierce .....	" .....	E. B. Sadler. ....	" .....
Levi O. Wade .....	" .....	J. A. Jeffrey .....	Columbus.
George Wilshire.....	Cincinnati.....		

CAPITAL STOCK.

CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$6,000,000 00
preferred .....	475,000 00
Number of shares—common.....	120,000
preferred .....	9,500
Par value of each—common.....	\$50 00
preferred .....	\$50 00



## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$4,005,750 00	
preferred .....	429,037 45	
Amount subscribed—common .....	4,005,750 00	
preferred .....	429,037 45	
Total paid in capital stock—common .....	4,005,750 00	
preferred .....	429,037 45	
Average amount paid in per mile of single main track (169.76 miles)...		\$26,123 87
Agents authorized to transfer stock : J. L. Moore, Treasurer, Sandusky ; A. P. Simpson, Transfer Agent, 38 India St., Boston ; Union Trust Co., 73 Broadway, New York.		
Number of shares transferred within the year at such agencies : Can- not state ; have discontinued stock transfer reports to general office.		

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of inter- est.	6. Amount of authorized issue.	7. Amount actually issued.
S., C & I. R. R. Co.	1st mortgage on part of road .....	Mar. 1, 1852	Mar. 1, 1887	7	\$350,000 00	\$350,000 00
S., Day. & C. R.R....	1st mortgage on part, 2d mort'ge, on bal. of road..	Feb. 1, 1851	Feb. 1, 1900	6	1,000,000 00	715,000 00
" Eastern." Not extended; part of old issue; probably lost; not regarded as actual obliga- tion, although remaining on books .....						4,000 00
Cin., San. & Cleave.	2d mort. on part, 3d mort. on bal.	Jan. 9, 1868	June 1, 1890	7	1,100,000 00	1,072,300 00
C., S. & C. scrip....						425 60
C., S. & C. coupon bond scrip cer- tificates .....		June 1, 1877	June 1, 1887	7		219,187 50
Total .....						\$2,356,913 10

Issued .....	\$993,000 00	
In sinking fund .....	278,000 00	
		\$715,000 00
Average amount per mile of single main track (169.76 miles) .....		\$13,883 79
Decrease since June 30, 1880 .....		14,000 00
Amount in hands of trustees of sinking fund for redemption .....		6,548 21

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc. ....	\$217,796 45
Total unfunded debt .....	217,796 45
Cash securities, debit balances, etc., available to payment .....	229,608 07
Net unfunded debt (surplus assets over unfunded debt) .....	11,812 62
Decrease since June 30, 1880 .....	110,376 48

Total net debt liabilities.....	2,345,100 72
Average amount per mile of single main track .....	13,814 21
Total of paid in stock and debt.....	6,791,700 55
Total average amount per mile .....	40,007 66
Total expended for construction and purchase .....	6,221,026 13
Average cost per mile of road constructed (single main track, 169.76 mi.)	36,646 01
Proportion of same for Ohio: All.	

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Sandusky to Springfield.....	130.15 miles.	130.15 miles.
Springfield to Columbus.....	44.37 "	44.37 "
Carey to Findlay .....	15.51 "	15.51 "
Total single main track .....	190.03 miles.	190.03 miles.
Aggregate of sidings and other tracks.....	15.64 "	15.64 "

Total length laid with rail computed as single track... 205.67 miles. 205.67 miles.

Laid with steel rail: About 70 miles.

Length in Ohio, distributed as follows:

County.	Main track.	Branches.	Sidings, etc.	Total.
Erie .....	8.20		2.54	10.74
Sandusky .....	13.80		.47	14.27
Seneca.....	24.14		1.59	25.73
Wyandot .....	14.82	4.29	.74	19.85
Hancock.....		11.22		11.22
Hardin .....	24.10		1.82	25.92
Logan .....	21.50		1.34	22.84
Champaign .....	15.85		.69	16.54
Clarke .....	21.30		3.60	24.90
Greene .....	5.34			6.05
Montgomery .....	5.20		7.71	12.20
Total .....	154.25	15.51	20.50	190.26

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Columbus, Springfield and Cincinnati Railway.....	44.37 miles.	44.37 miles.
Sidings and other tracks.....	2.25 "	2.25 "
Total.....	46.62 miles.	46.62 miles.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet, 8½ inches.
Grade—Maximum, per mile .....	43 feet.
Longest maximum.....	2,640 "
Curvature—Shortest radius .....	955 "
Aggregate length of shortest radius.....	1,000 "
Rail—Iron—On road (about).....	120 03 miles.
Average weight per yard.....	56 lbs.
Steel—On road.....	70 miles.
Average weight per yard .....	40 and 60 lbs.
Ties—Average number per mile.....	2,640
Number laid during the year (10 months, ending Apr. 30, '81)..	60,086
Ballasted—On whole line.....	190.03 miles.
In Ohio .....	190.03 "

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood—19.

Trestles—6; greatest height, about 30 feet; greatest length, 150 feet.

Length of shortest span of truss, 59 feet; of longest, 125 feet.

Greatest space between cross ties upon bridges and trestles, 24 inches;  
length of ties, 8 feet.

\* Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Yearly.

Are the examinations analytical, and are they made by a competent person? Made by bridge builder.

Kind of fencing, as follows: Board and barbed-wire.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Columbus & Toledo, Little Miami, and C., C. & I. C. R'y at Columbus.

Little Miami R'y at London.

Ohio Southern and C. C. C. & I. R'y at Springfield.

N. Y., P. & Ohio and C. C. & I. C. R'y at Urbana.

C., C. C. & I. R'y at Bellefontaine.

P., Ft. W. & C. R'y Co. at Forest.

Columbus and Toledo at Carey.

Ohio Central Railroad at Berwick.

B. & O. and N. W. Ohio R'y at Tiffin.

L. S. & M. S. R'y at Clyde.

L. S. & M. S. R'y and L. E. & W. at Sandusky.

What railroads cross your road either over or under your grade in this State, and where? None.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated, in Ohio, 175.

Miles of same owned by railroad company: None. Owned by A. & P. and W. U. Tel. Co.

## STATIONS.

Passenger and freight .....	30
Number with telegraph communication .....	18
Number of same operated by railroad company .....	18
Is pay received for messages sent over line owned by railroad company? Yes, for commercial messages.	

## ROLLING STOCK.

Locomotives, 31; average weight.....	56,000 lbs.
Express and baggage, 12; average weight.....	23,000 "
Passenger cars, 21; average weight.....	36,000 "
Parlor and sleeping cars, 4; average weight .....	45,000 "
Freight cars (report not made).	
Number of locomotives equipped with train brakes, 11.	
Kind of brake: Miller & Ransom's.	
Number of cars equipped with train brakes, all coaches, express, baggage, sleeping and parlor cars.	
Kind: Miller & Ransom's.	
Number of passenger cars with "Miller Platform," all.	
Method of bridging between passenger cars, when two or more are run in trains: Miller Platform.	
Are all cars run on this road heated and lighted as prescribed by law? Yes.	
State methods of heating cars used for the transportation of passengers: Stoves.	
Means of lighting same: Lamps.	

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation .....	20 "
Freight trains .....	12 "

## EMPLOYES.

Superintendents and Ass't Sup't.....	2
Telegraph operators .....	18
Engineers.....	27
Baggagemen .....	10
Flagmen, switch-tenders and watchmen .....	20
Laborers .....	75

Clerks .....	14
Train dispatchers.....	1
Firemen .....	31
Wipers .....	10
Mechanics .....	45
Conductors.....	21
Brakemen .....	36
Station agents .....	29
Section men.....	180
Other employes .....	100

Total number employed by company in operating line..... 619

Proportion for Ohio..... 619

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: United States.

Terms: \$53 per diem for 8,000 lbs. between Springfield and Sandusky, through and way. Excess over 8,000 lbs. to be paid for per 100 lbs., viz., through, 50 cents; way, 35 cents. American Express Co., \$150 per month between Springfield and Columbus.

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—

	Highest.	Lowest.
For distances less than 8 miles.....	5 Cts.	3 Cts.
For distances over 8 miles—First class.....	3	1
Second class.....	2½	1
Emigrant .....	2½	1
Excursion.....	2	¾

Amount charg'd in addition to regular fares in sleep'g or other cars run on your road:

For seat, 25 cts. to \$1.00; berth, \$1 50; section, \$3.00.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

	175 miles.	11 miles.
First class .....	.0017 Cts.	.009 Cts.
Second class .....	.0015	.009
Third class .....	.00115	.008
Fourth class .....	.00086	.008
Fifth class .....	.00057	.0055
Special class .....	.00046	.0045

## Rate per ton per mile on freight carried less than 30 miles:

First class .....	5 Cts.	5 Cts.
Second class.....	5	5
Third class .....	5	5
Fourth class.....	5	5
Fifth class.....	5	5
Special class .....	5	5

## Rate per ton per mile on freight carried more than 30 miles:

	175 miles.	34 miles.
First class .....	.034 Cts.	5 Cts.
Second class .....	.03	5
Third class .....	.023	5
Fourth class.....	.016	5
Fifth class .....	.011	4
Special class .....	.01	3

## Rate per ton per mile for—

Coal—Carried ten miles or more, 130 .....	$\frac{6}{10}$ Cts.	$\frac{6}{10}$ Cts.
Carried less than ten miles .....	5	5
Pig iron—Carried ten miles or more, 130 .....	$\frac{6}{10}$	5
Carried less than ten miles .....	5	5
Limestone—Carried ten miles or more, 98.....	1½	1½
Carried less than ten miles.....	5	5
Iron ore—Carried ten miles or more, 130 .....	$\frac{6}{10}$	$\frac{6}{10}$
Carried less than ten miles.....	...	...
Undr'd stone or lumber—Carried ten miles or more, 175	$\frac{8}{10}$	$\frac{8}{10}$
Carried less than ten miles	5	5

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Rail laid—Rerolled iron, 1,654 $\frac{3101}{2210}$  tons, 56 lbs. per yard—miles of track, 18.81.

Train mileage—Passenger .....	353,375	
Freight .....	208,806	
Switch .....	89,536	
Construction .....	21,946	
Total.....		673,663
Car mileage—Passenger, express and baggage.....	997,205	
Freight—loaded .....	2,833,654	
empty .....	1,241,173	
Caboose.....	194,709	
Total.....		5,267,741
Fuel consumed—Wood, 1,170 $\frac{12}{10}$ cords, \$2,548.47; coal, 16,274½ tons, \$36,322.71. Total cost .....		\$38,871 18
Losses, etc., paid—On goods and baggage .....		417 74
For injuries in Ohio, fatal and non-fatal: to employees.....	1,104 80	
Total.....		\$1,104 80

For animals killed in Ohio:

Horses, 7.....	\$819 90
Cattle, 8.....	170 00
Sheep, 51.....	50 00
Total.....	<u>\$1,039 90</u>

## TRANSPORTATION (10 MONTHS).

Passengers—Number carried, local .....	232,307
through .....	42,551
Total.....	274,858
Average number of miles traveled by each.....	31.24
Total mileage, or number carried one mile.....	8,585,437
Average amount received for each.....	79.41 cents.
Average amount <i>per mile</i> received for each.....	2.54 "

EARNINGS, OPERATING EXPENSES, FROM JUNE 30, 1880, TO MAY 1, 1881.

### EARNINGS.

Passenger transportation—local.....	\$164,256	35
through.....	54,026	59
Total.....		\$218,282 94
Freight transportation.....		395,748 06
Mail service .....		8,054 83
Express service.....		18,817 67
Other sources .....		8,210 52
Total earnings of line operated included in this report ...		\$649,114 02

OPERATING EXPENSES.

Maintenance of way and structures.....	\$112,620	50
Maintenance of cars .....	33,207	65
Motive power .....	130,348	11
Conducting transportation .....	44,157	52
General expenses, as follows:		
Taxes in Ohio .....	31,174	73
Station expenses, Springfield .....	70,480	90
New head office,       " .....	5,383	04
Shop expenses,       " .....	6,485	68
Salaries .....	27,612	14
Other general expenses of operating .....	9,115	64
Total operating expenses .....	\$470,586	00
Net earnings.....	178,528	02
Rentals paid for use of road, track, depots, equipment, etc .....	66,666	67
	\$111,861	35



Received Cincinnati and Springfield Railway, \$81,097.27; and I., B. & W. Railway, rentals, \$36,666.66.....	117,763 93
Net income over operating expenses and rents paid .....	229,625 28
Percentage of same to capital stock and debt .....	3 38
Per mile of earnings..... \$3,416 90; proportion for Ohio (190.03 miles)..	All.
operating expenses..... 2,476 37	
Net earnings .....	\$940 53

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Decrease of floating assets, sale of material, etc.....	\$98,604 32
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds—scrip.....	\$159,141 00
Premiums and commissions for paying coupons .....	15,762 82
Interest on floating debt .....	7,003 47
Dividends, rate 6 per cent. on preferred stock.....	25,731 00
Floating debt liquidated.....	110,376 48
Applied to sinking fund .....	10,181 36
Total.....	\$328,196 13

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Capital stock .....	\$4,005,750 00
Preferred stock.....	429,037 45
Bonds, S. D. & C .....	715,000 00
Bonds, eastern, not extended.....	4,000 00
Bonds, S., C. & I .....	350,000 00
Bonds, Cincinnati, Sandusky & Cleveland .....	1,072,300 00
Bonds, “ “ scrip.....	425 60
Bonds, “ “ coupon bond scrip certificates .....	219,187 50
Sinking fund bond coupons.....	109,080 00
Coupons and dividends, preferred stock uncalled for.....	11,325 00
Coupons on bond scrip .....	8,539 84
Bills payable.....	4,904 10
Notes payable .....	82,442 32
Wood and tie certificates .....	359 35
Columbus, Springfield & Cincinnati Railroad Co., rental account .....	1,145 84
	<hr/> \$7,013,497 00

## ASSETS.

Railway .....	\$6,221,026 13
Material.....	2,636 40
Columbus, Sandusky & Cincinnati Railroad Co., stock.....	505,750 00
Sinking Fund Trustees.....	6,548 21
Coupon agencies.....	8,081 18
A. P. Simpson, bond, scrip, coupon account .....	8,539 82
Nat. Fire Ins. Co. (in assignment) .....	5,720 30
Individual accounts.....	23,688 81
Uncollected earnings.....	7,003 25
Estimated value of remaining property recovered from R. R. Sloane in settlement of suits against him.....	120,000 00
Cash, New England Trust Co.....	15,624 16
Treasurer .....	38,314 15
Profit and loss .....	50,564 59
	<hr/> \$7,013,497 00

## TRAIN ACCIDENTS—ENTIRE LINE.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
Aug. 19	Grant's siding...	Freight .....	Extra south protected our siding on to main track. Regular freight north ran into extra.	Damage to locomotives and some cars. Engineer of regular freight train scalded.
Dec. 28	South of Tiffin ..	Freight .....	Freight No. 1 pulled out of Tiffin on time of passenger No. 6, and trains collided about 1 mile south of Tiffin.	Baggage car burnt, locomotive damaged, and fireman of passenger train killed. Engineer of passenger train slightly injured (jumped).

## SUMMARY OF TRAIN ACCIDENTS.

Number:

Collisions—butting ..... 2

Causes of collisions:

Carelessness in side tracking ..... 1

Running carelessly on time of passenger train contrary to rules..... 1

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Total..... 2

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1880.				
July 15	Patrick Horan.....	Brakeman.....	Coupling cars.....	Four fingers amputated.
27	Isaac Tjldin.....	Teamster.....	Asleep on car.....	Slight injury.
August 8	David Shannon.....	Brakeman.....	Struck by overhead bridge.....	Head cut slightly.
17	Thomas Kelly.....	Not known.....	Fell between cars.....	Killed.
19	J. J. Richter.....	Engineer.....	Collision with train on siding.....	Badly scalded.
Oct. 1	Rachel Gattion.....	Passenger.....	Jumped from train.....	Broken ankle.
5	Geo. Peters.....	Pickpocket.....	".....	Broken leg.
18	John Barret.....	Brakeman.....	Coupling cars.....	Thumb mashed.
28	Cornelius Murphy.....	Not known.....	Run over at street crossing.....	Died November 4th.
Nov. 19	John Fitzgerald.....	Brakeman.....	Coupling cars.....	Two fingers amputated.
Dec. 6	H. Scadden.....	".....	Squeezed between cars.....	Shoulder broken.
16	Unknown man.....	Tramp.....	Fell between cars (supposed insane).....	Killed.
19	Lewis Dittenrother.....	".....	Struck by train.....	Right leg cut off.
28	Wm. Woodbury.....	Fireman.....	Collision.....	Killed.
28	Robert Haylor.....	Engineer.....	".....	Injured.
29	John Leach.....	Brakeman.....	Struck by overhead bridge.....	Slight.
1881.				
Jan'y 14	Wm. Curtis.....	Brakeman.....	Coupling cars.....	Head mashed.
Feb'y 2	Wm. Howard.....	".....	Struck by overhead bridge.....	Not serious.
March 22	Chas. Smith.....	Yardman.....	Attempted to step on pilot of switch engine, fell and was run over.....	Fatal.
25	Ed. Whitney.....	".....	Struck by overhead bridge at Columbus.....	Very slight.
April 3	Jno. Carty.....	Cash'r, 3d Nat. Bank, Urbana..	Fell between cars.....	Disabled for two weeks.
30	Evan G. Wiley.....		Probably attempted to cross on platform, between coach and baggage cars, while train No. 12 was at Urbana, and by sudden starting of train was thrown between cars and caught in some way and crushed under the car. It does not appear that wheels passed over him.....	Almost instantly killed.
Feb'y 28	G. W. Baker.....	Brakeman.....	Pulling pin.....	Sec'd finger of right hand crushed.

## PERSONS KILLED—CAUSES.

Employees—Run over in yards, on sidings, or in switching.....	1
Collisions, and standing on platform of car during same.....	1
Coupling, or crushed between cars and engine.....	1
Others—Run over in yards, on sidings, or in switching.....	2
Falling or thrown from engine or train .....	2
Riding or driving across track.....	1
<hr/> Total .....	8

## PERSONS INJURED—CAUSES.

Passengers—Jumping from train .....	2
Employees—Struck by bridge, chute, or other obstruction .....	4
Coupling, or caught between cars and engine .....	6
Falling or thrown from engine or train .....	1
Collisions .....	2
<hr/> Total .....	15

## RECAPITULATION.

Killed—Employees—from causes beyond their control.....	1
misconduct or want of caution .....	2
Others—at stations and highway crossings.....	1
stealing rides .....	1
trespassing, on track, etc.....	3
<hr/> Total killed.....	8
Injured—Passengers—misconduct or want of caution .....	2
Employees—from causes beyond their control.....	2
misconduct or want of caution.....	11
<hr/> Total injured .....	15

*State of Ohio, County of Erie, ss.:*

J. L. Moore, Treasurer of the Cincinnati, Sandusky and Cleveland Railroad Co. being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

J. L. MOORE,

*Treasurer.*

LEASE OF THE CINCINNATI, SANDUSKY AND CLEVELAND, AND  
COLUMBUS, SPRINGFIELD AND CINCINNATI RAILROADS, TO  
THE INDIANAPOLIS, BLOOMINGTON AND WESTERN  
RAILWAY COMPANY.

Preamble.

WHEREAS, The Cincinnati, Sandusky and Cleveland Railroad Company, and the Columbus, Springfield and Cincinnati Railroad Company, corporations existing by virtue and authority of the laws of the State of Ohio, and the Indiana, Bloomington and Western Railway Company, a corporation existing by virtue and authority of the laws of the States of Ohio, Indiana and Illinois, the two former of which companies have lines of railroad constructed and in operation from Sandusky to Dayton, in said State of Ohio, and from Columbus to Springfield, in said State of Ohio, and connecting at said Springfield; and whereas, the said Indiana, Bloomington and Western Railway Company now owns and operates a line of railroad from Pekin, in the State of Illinois, to Indianapolis, in the State of Indiana, and is now extending its said line of railroad from said Indianapolis to Springfield, Ohio, by the construction of a new line of railroad, so as to connect at said Springfield with the lines of railroads of said Cincinnati, Sandusky and Cleveland, and Columbus, Springfield and Cincinnati Railroad Companies, so as to form a continuous line for the passage of cars, and thereby to increase its facilities for doing an east and west bound business, and to render more profitable the large amount of freight and passenger business it expects to bring to said Springfield, and to further facilitate this purpose, desires to obtain a lease in perpetuity, or for as long a term as it lawfully can of the lines of railroad of said Cincinnati, Sandusky and Cleveland, and Columbus, Springfield, and Cincinnati Railroad Companies; and whereas, the said lines of railroad are continuous and not competing, and the boards of directors of the Cincinnati, Sandusky and Cleveland, and Columbus, Springfield and Cincinnati Railroad Companies aforementioned, having entered into an agreement to make such a lease or leases, and submit the same for the consideration and ratification of the stockholders of their respective corporations.

Date.

Now, therefore, this indenture, made this eighth day of March, in the year of our Lord eighteen hundred and eighty-one, by and between the said Cincinnati, Sandusky and Cleveland Railroad Company, and the Columbus, Springfield and Cincinnati Railroad Company, parties of the first part, and the said Indiana, Bloomington and Western Railway Company, party of the second part, witnesseth, that the parties of the

Consideration

first part, for and in consideration of the payments, covenants and agreements hereinafter mentioned, by, for and in behalf of the party of the second part, its successors and assigns, to be paid and performed, and upon the conditions and restrictions hereinafter stated, the said parties of the first part do hereby grant, lease and demise unto the said party of the second part, its successors and assigns, the entire railroads of the said parties of the first part, lying in and extending from the city of

Demise.

Sandusky, in Erie county, to the city of Dayton, in Montgomery county, and from the town of Carey, in Wyandot county, to the town of Findlay, in Hancock county, and from the city of Columbus, in Franklin county, to the city of Springfield, in Clarke county, all in the State of Ohio, now constructed, or which shall hereafter be constructed, as provided in this agreement, that is to say, their real estate and rights of way, their side tracks, machine shops, engine houses, warehouses, road bed, gravel pits, bridges, superstructure, track and appurtenances connected with the same, their depot stations, water-houses, rolling stock and equipment, and all property, rights and interest of every description, acquired and now held, or which hereafter shall be acquired by said parties of the first part, for the construction, maintenance and operation of said railroad that may be appurtenant thereto and necessary for their operation or intended for such use, to have and to hold said railroads and all and singular the premises with their appurtenances hereinbefore demised and expressed or intended so to be, unto the said Indiana, Bloomington and Western Railway Company, its successors and assigns, from the 1st day of May, A. D. 1881, for and during and until the end of the full term of ninety-nine years thence next ensuing, and renewable from time to time for like periods forever; provided, however, that whereas, the parties of the first part have heretofore issued four series of bonds now outstanding, and have also issued preferred stock, not exceeding in the aggregate four millions of dollars, the payment of which is secured by deeds of trust of the entire property of the said parties of the first part, the said parties of the first part, their successors and assigns, shall have the right, and this indenture is made upon the express condition, that at any time hereafter, by agreement with the holders of said bonds and preferred stock, they may extend the time of payment of same, or said parties of the first part, their successors and assigns, may substitute new bonds and preferred stock therefor, and secure the payment of such new bonds and preferred stock by other deed or deeds in trust of their entire property, including the railroads and other property hereby demised, and in such case the said deed or deeds in trust last mentioned, and the preferred stock shall be a prior lien in all respects on any right, title or interest acquired by said party of the second part, its successors and assigns, under and by virtue of this indenture, as the former deeds in trust, and with same priority of lien. The total amount of bonds and preferred stock so extended or substituted, however, shall not at any time exceed in the aggregate the sum of four millions of dollars without the consent of the said party of the second part; and the said parties of the first part, their successors and assigns, hereby covenant and agree with the party of the second part, its successors and assigns, that during said term of ninety-nine years, or any other term of years hereby granted and demised, they will at all times keep and maintain their corporate existence and organization; that they will not, knowingly, do or omit to do any act or thing whereby their corporate powers, rights or privileges, nor the term hereby created may be forfeited or endangered, and the possession and use of said railroads and premises hereby granted to said second party, its successors and assigns, restricted; and said parties of the first part, their

Term of 99 years.

Bonds and preferred stock of first parties.

Renewal of funded debt and preferred stock.

Corporate organization of first parties to be kept up.

Quiet possession.

successors and assigns, hereby covenant and agree with the party of the second part, its successors and assigns, that during the said term of ninety-nine years, or any other term herein provided, it shall at all times peaceably and quietly have, hold and enjoy the said demised and granted railroad premises and appurtenances, without let, hindrance, or interference from said parties of the first part, their successors or assigns, or of any person or persons, whomsoever, claiming from or under it or them, or either of them. And the said parties of the first part, their successors and assigns, further covenant and agree, that on or before the expiration of the term of ninety-nine years, or any other term herein provided, they will, or either of them, at the request and expense of the said party of the second part, its successors or assigns, grant and execute to the said party of the second part, its successors and assigns, a new lease of the railroads and premises hereby demised, for the further term of ninety-nine years, to commence at the expiration of the term hereby granted, and at or before the expiration of every renewal thereof, at the same rental, payable in like manner, and subject to the like covenants, agreements, conditions and restrictions as are contained in these presents.

Renewal of lease.

Appropriations and legal instruments to be made by first parties.

And said parties of the first part further covenant and agree, that upon the request of said party of the second part, its successors and assigns, it or they or either of them will proceed under the laws of the State of Ohio, and appropriate such real estate and rights and interests as may be required for the maintenance and operation of their or either of their lines of railroad, said party of the second part, its successors and assigns, paying all costs and damages therefor, or for which said parties of the first part, or either of them, may thereby become liable; and further, that upon like request, and at the cost and charge of said party of the second part, its successors and assigns, the said parties of the first part, their successors and assigns, will make and execute such further and other lawful deeds, assurances and confirmations of the railroads and premises hereby granted, or intended so to be, unto the said party of the second part, its successors and assigns, as it or they shall reasonably, or by right, require. And the said party of the second part, its successors and assigns, hereby covenants and agrees with the parties of the first part, their successors and assigns, that it will pay as rental for the aforementioned granted and demised railroads and appurtenances, thirty-three and one-third per centum of the total gross earnings and receipts of said granted and demised railroads and property, which said thirty-three and one-third per centum of said gross earnings and receipts, it is hereby guaranteed by said party of the second part, its successors and assigns, shall not be less than three hundred thousand dollars (\$300,000) in any one year during the continuance of this lease; and if from any cause said thirty-three and one-third per centum of the said gross earnings and receipts should in any year fall short of three hundred thousand dollars (\$300,000), the said party of the second part, its successors or assigns, will make up and pay each and every such deficit out of its or their own money. And whenever the said thirty-three and one-third per centum of the said gross earnings and receipts shall exceed in

Rental.



any one year the sum of five hundred and fifty thousand dollars (\$550,000), all such excess shall inure to and be retained by the party of the second part. Said gross earnings and receipts are to be determined from the entire gross earnings and receipts from all sources whatsoever or however derived of the railroads and property hereby leased, or any portion thereof, and the business of the roads shall be so transacted, and the books and accounts thereof so kept by said party of the second part, its successors and assigns, as to clearly exhibit the said entire gross earnings and receipts, without any deduction whatsoever; said amount of three hundred thousand dollars (\$300,000) per annum guaranteed rental shall be paid to the parties of the first part, in equal monthly payments of twenty-five thousand dollars each, at the end of each and every month from the date of this lease, and the balance of the thirty-three and one-third per centum of the said gross earnings and receipts shall be paid quarter-yearly, on the first days of October, January, April and July of each and every year from and after the date of this lease. Eight one-thirtieths of said guaranteed rental to be so paid to the said Columbus, Springfield and Cincinnati Railroad Company, and twenty-two one-thirtieths to said Cincinnati, Sandusky and Cleveland Railroad Company, and one-fifth of the balance of the said thirty-three and one-third per centum of the said gross earnings and receipts shall be paid to the said Columbus, Springfield and Cincinnati Railroad Company, and four-fifths to the said Cincinnati, Sandusky and Cleveland Railroad Company. Said party of the second part, its successors and assigns, further agree, that it or they will render to the said parties of the first part, their successors or assigns, properly detailed accounts of said gross earnings and receipts quarter-yearly, and will allow said parties of the first part, their successors and assigns, by their proper officers or employes duly authorized, such free access to its or their books, papers and accounts, as may be required to ascertain the correctness of the accounts so rendered; provided always, and these presents are upon the express condition that if the said party of the second part, its successors and assigns, shall neglect or fail to pay to the said parties of the first part, their successors or assigns, the amount of rental hereinbefore provided to be paid, or any part thereof, for a period of thirty days after the same ought to have been paid, as aforesaid, or in case the said party of the second part, its successors and assigns, shall not from time to time, and at all times, during the continuance of this lease, well and truly observe, perform, fulfill and keep all and singular the covenants, conditions and agreements hereinbefore or hereinafter contained, which are or ought to be kept and performed by said party of the second part, its successors and assigns, according to the true intent and meaning of these presents, then in any and every such case the said parties of the first part, their successors and assigns, shall have the right to re-enter upon said railroads and other premises hereby demised, and to repossess and enjoy the same as of their former estate, anything hereinbefore contained to the contrary thereof in anywise notwithstanding; and the said party of the second part shall be liable to the parties of the first part, and each of them for all damages which

Determination of amount of gross earnings.

Account.

Payment of rental.

Division of rental.

Accounts and quarterly statements.

Inspection of accounts.

Right of re-entry.

Damages for default.

Notice of default.	they, or either of them, may sustain by any default of the party of the second part, but no such forfeiture shall be declared unless the said party of the first part shall have first notified the said party of the second part, of the default complained of, and requested the performance of this contract in that behalf by the said party of the second part, its successors and assigns; and the said party of the second part, its successors and assigns, further agree that it or they will diligently prosecute the building of the line of railroad from Indianapolis to Springfield, hereinbefore named, and complete the same and have it duly connected and in operation with the line of railroad of said party of the second part at said Indianapolis, and with the lines of railroad of said parties of the first part at said Springfield, on or before January 1, 1882, and will run and operate the said line of road in connection with the lines of the parties of the first part, and will not become interested in the earnings of any competing railroad to the roads of the parties of the first part of either of them.
Road from Indianapolis to Springfield.	
Interest in earnings of competing roads.	
Disposition of traffic.	And said party of the second part further agrees that all business coming from its lines of railroad to said Springfield, and destined for points north and north-east thereof, shall be sent over the Cincinnati, Sandusky and Cleveland Railroad as far towards Sandusky as may be necessary to secure the greatest amount of earnings therefrom to the parties of the first part. And all business destined for points east and south-east thereof shall be sent by way of Columbus, over the Columbus, Springfield and Cincinnati Railroad. And the said party of the second part, its successors and assigns, hereby covenants and agrees with the said parties of the first part, their successors and assigns, that it and they will, during the term hereby granted, well and truly pay the rental hereinbefore provided promptly at the times and in the manner limited and prescribed herein for the payment thereof, according to the true intent and meaning of these presents; and that, in computing the amount of the total receipts and earnings on the lines of the railroads of the parties of the first part, it will allow on all through business between Peoria and Sandusky, and between Peoria and Columbus, full pro rata to each road, according to the number of miles hauled on each. And said party of the second part, its successors and assigns, further agree that it and they will, during the continuance of this lease, maintain and keep in good order and condition, by renewals and repairs, the railroads and other property hereby demised, and to add such new cars, engines, and rolling-stock as may be necessary to replace such as may become worn-out or destroyed, so as to keep said equipment up to its present standard of value and efficiency, and to mark distinctly, in the usual manner, all such new cars, engines, and rolling-stock, to denote that they appertain and belong to the Cincinnati, Sandusky and Cleveland Railroad Company, and so deliver them upon the railroad of said company free from all liens as its property, subject only as their other property to the terms of this lease; and all such cars, engines, or other rolling-stock, shall be so distinctly marked, as aforesaid, before leaving the shops or places of manufacture. The party of the second part, its successors and assigns, will also make all renewals of track upon the railroads of the parties of the first part with steel rails of not
Payment of rental.	
Computation of gross receipts.	
Maintenance of property leased.	
New equipment.	
Renewals of track.	

less than fifty-six pounds to the linear yard, and will, as rapidly as good management may require, provide the entire tracks of the railroads of the parties of the first part with such steel rails, and will, at all times, keep and maintain the tracks of said railroads, and each of them, in first-class condition of repair; that it and they will also run and operate said railroads of the parties of the first part in such a manner that the corporate rights and privileges of said parties of the first part shall not be impaired or endangered; that it will furnish the public all reasonable accommodation in the running of its trains and otherwise over said roads of the parties of the first part; that it will indemnify and save harmless the said parties of the first part from all liability and claims for damages and losses incurred and arising, in any manner, in the running of said railroads; and, in general, that it will operate said railroads of the parties of the first part, and furnish such equipment, stations, and other appurtenances therefor, as are suited for and required by a railroad of the best class, and that it will use all necessary and possible efforts to facilitate and increase the business of the railroads hereby leased. The said party of the second part further agrees that it will pay all taxes, and assessments whatsoever, that may be levied by either the State of Ohio, or the United States of America, or under the authority of either thereof on the roads and property hereby demised, or on their earnings and receipts, and on all dividends and interest which may be paid by the parties of the first part, but not including any taxes or assessments which may be made against the individual holders of the stock or bonds, of the parties of the first part; that it will procure and keep policies of insurance in full force upon all bridges, docks, buildings, engines, cars, and other equipment and machinery, and other property hereby demised, to the extent at least of two-thirds of the full value thereof, and to have such policies written for the benefit of whom it may concern, and fully protecting and referring to the respective interests of the parties hereto, and in case of loss, all sums recovered from underwriters of existing or future policies of insurance shall inure to the party of the second part, and to be expended in repairing or replacing, as the case may be, the property damaged or destroyed.

The party of the second part shall, whenever requested by the parties of the first part, or either of them, furnish a special car and transport therein, the Board or Boards of Directors of the parties of the first part, or a committee thereof, free of cost, over the roads of the parties of the first part, as often as four times each year, if required, giving them suitable time and opportunity to examine the condition of the roads and other property hereby demised. The party of the second part, its successors and assigns, also further agree, that it or they will not transport any wood or ties cut in any of the counties of the State through which the lines of the railroads of the parties of the first part pass, at less than the regular local rates for timber, lumber and wood.

It is also mutually agreed between the parties hereto, that in case the parties of the first part, their successors and assigns, shall fail to pay the interest or principal of the bonds or preferred stock hereinbefore

Tracks.

Operation of road.

Indemnity against damages.

Appurtenances.

Increase of business.

Taxes.

Insurance.

Free carriage of Directors.

Carriage of wood and ties.

Failure of first parties to pay their interest or dividends.

named, for a period of thirty days after the same shall have become due and payable, the said party of the second part, its successors and assigns, may proceed and pay the same to the parties entitled thereto, out of the rental created and provided for under this lease, and the amount so paid shall be charged to the parties of the first part, and deducted from the money then due or to become due, to the parties of the first part under this lease.

Renewal of  
first parties'  
securities.

In case the parties of the first part should fail to extend the time of payment of any of said bonds, or negotiate new securities in lieu of them, as hereinbefore provided, then the said party of the second part may renew the same at a rate of interest not in excess of that now payable on said bonds respectively, or may pay and discharge said bonds and have a lien upon the premises hereby demised for the payment of the same, and a credit on the rental herein reserved of the amount of the interest on the bonds so paid.

Material and  
supplies on  
hand.

It is also further mutually agreed and understood between the parties hereto that the Cincinnati, Sandusky and Cleveland Railroad Company sells to the party of the second part, all the fuel, lumber, timber, new ties, oil, waste, and all new and old rails not in the track at the time this lease goes into effect, and all such stationery and other supplies furnished for use upon the lines of railroad hereby leased, as may be available for use and desired by said party of the second part.

Inventories  
and apprais-  
ments.

An inventory and cost appraisal of the aforementioned supplies and rails shall be made before this lease goes into effect, by three persons, one of whom shall be appointed by the parties of the first part, one by the party of the second part, and the other by the two persons so appointed, the decision of either two of which shall be final, both as to the quantities of said supplies and rails thus sold, and their cost value as hereinbefore named, the total amount of which said cost value, the party of the second part hereby agrees to pay in cash, to the said Cincinnati, Sandusky and Cleveland Railroad Company, in or within thirty days after this lease goes into effect. It is also mutually agreed that all the tracks, bridges, buildings, locomotives, cars, and other property of the parties of the first part hereby leased, shall, as soon as practicable, and within sixty days after the date of this lease, be duly inventoried and appraised in manner and form as hereinbefore provided for the inventory and appraisal of the supplies and rails; and said inventory and appraisal when completed, shall be copied in triplicate, one copy thereof to be placed for filing and record with the Indiana, Bloomington and Western Railway Company, and one copy for like purpose to each the Cincinnati, Sandusky and Cleveland Railroad Company, and the Columbus, Springfield and Cincinnati Railroad Company, and also for the purpose of enabling the respective parties hereto the better to determine from time to time if any waste or depreciation of the property has taken place; said appraisal to be made on a basis of value in gold coin of the United States of America, and at the termination of this lease, a like inventory and appraisal shall be made in like manner, of the same or substituted property, to determine whether all such property is then in as good or better or worse condition of efficiency, and the parties making

Basis of  
appraisal.

such inventory and appraisal, shall appraise the difference in value, if any, and any such difference shall be equalized by payment from one party to the other, as the case may require, and to have such waste or depreciation, or betterment and improvement, if any, as the case may be, restored and made good.

It is also agreed by the parties of the first part that the party of the second part, its successors and assigns, shall have the right to use the name of the parties of the first part, so far as it may be necessary for it to do so in bringing any actions and in making any defences. It is also further agreed by the party of the second part, its successors and assigns, that the Cincinnati, Sandusky and Cleveland Railroad Company shall, retain to itself, for its own uses and purposes, all real estate it may possess not appurtenant to its line of railroad or necessary for its use and operation, more particularly the properties recovered from Rush R. Sloane, its former president; and, whereas, the said Cincinnati, Sandusky and Cleveland Railroad Company has heretofore leased the portion of its road between Springfield, in Clarke county, and Dayton, in Montgomery county, the said party of the second part assumes such lease and all existing contracts and agreements of said parties of the first part; and it is also hereby mutually agreed that if, from any cause, either of the parties hereto shall neglect or fail to appoint the person herein provided to act as appraiser for the inventorying and appraisal of the supplies and rails, and of the track, locomotives, etc., etc., hereinbefore named, it shall be competent for the appraiser appointed by the other party to appoint both of such other appraisers; and it is further agreed that the party of the second part will furnish, free of charge, to the parties of the first part, suitable rooms and accommodations in the general office buildings at Sandusky, Springfield and Columbus, Ohio, for the offices of the presidents, secretaries, and treasurers of the parties of the first part, and that, until the completion of the road of the party of the second part, said party of the second part will not change the managing agents and employes of the parties of the first part, except with the consent of the presidents of said parties of the first part.

IN WITNESS WHEREOF, the said parties hereto have caused this Lease to be signed by their respective Presidents, and attested by their respective Secretaries, and have caused their corporate seals to be hereto attached, the day and year above written, in triplicate.

{ SEAL. } THE CINCINNATI, SANDUSKY & CLEVELAND R. R. CO.  
By J. S. FARLOW, *President*.

Attest: J. L. MOORE, *Secretary*.

{ SEAL. } THE COLUMBUS, SPRINGFIELD & CINCINNATI R. R. CO.  
By J. S. FARLOW, *President*.

Attest: J. L. MOORE, *Secretary*.

{ SEAL. } THE INDIANA, BLOOMINGTON & WESTERN RY CO.  
By B. S. HENNING, *President*.

Attest: J. K. O. SHERWOOD, *Secretary*.

Use of names of first parties by second party.

Real estate of Cincinnati, Sandusky and Cleveland R. R. Company.

Lease to Cincinnati and Springfield R. R. Company.

Appointment of appraisers.

Office accommodations.

Present managing agents and employes.

INDIANA, BLOOMINGTON & WESTERN RAILWAY COMPANY,  
OPERATING CINCINNATI, SANDUSKY & CLEVELAND,  
AND COLUMBUS, SPRINGFIELD AND CINCIN-  
NATI RAILROADS, FROM MAY 1ST TO  
JUNE 30TH, 1881.

Name of road : The Indiana, Bloomington & Western Ohio Division Railway.

By whom owned : Cincinnati, Sandusky & Cleveland Railroad Company.

By whom operated : The Indiana, Bloomington & Western Railway Company.

By what authority : Lease.

Name of company making this report : Indiana, Bloomington & Western Rail-  
way Company.

General offices at Indianapolis, Indiana, and Sandusky, Ohio.

Principal office in Ohio at Sandusky.

Address correspondence relating to this report to C. E. Henderson, Assistant  
General Manager, at Indianapolis, Indiana.

#### HISTORY OF ORGANIZATION AND CONSTRUCTION.

May 1st, 1881. Lease for ninety-nine years, at a rental of  $33\frac{1}{3}$  per  
cent. of gross earnings.

#### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Austin Corbin.....	President.....	New York City.....	.....
G. E. Taintor.....	Vice President.....	".....	.....
J. K. O. Sherwood.....	Secretary.....	".....	.....
J. L. Moore.....	Treasurer.....	Sandusky, O.....	.....
G. L. Dicenson.....	Auditor.....	Indianapolis, Ind.....	.....
B. S. Henning.....	General Manager.....	New York City.....	.....
C. E. Henderson.....	Assistant Manager.....	Indianapolis, Ind.....	.....
D. W. C. Brown.....	General Superintendent...	Sandusky, O.....	.....
F. Woodbridge.....	Chief Engineer.....	Springfield, O.....	.....
H. M. Bronson.....	General Passenger Agent...	Sandusky, O.....	.....
C. B. Lockwood.....	General Freight Agent.....	".....	.....
H. M. Bronson.....	General Ticket Agent.....	".....	.....

#### DIRECTORS.

Name.	Residence.	Name.	Residence.
Austin Corbin.....	New York City	J. K. O. Sherwood.....	New York City
Alfred Sully.....	"	John S. Farwell.....	Claremont, N.H.
G. E. Taintor.....	"	B. K. Dow.....	"
Gilbert Oakley.....	"	John D. Adrian.....	Pou'k'psie, N.Y.
D. C. Corbin.....	"	J. B. Upham.....	Boston, Mass.
Henry W. Maxwell.....	"	F. N. Peck.....	Chicago, Ills.



## RATES OF TRANSPORTATION.

Freight—Average rate per ton per mile..... 1.607c.

## EARNINGS, OPERATING EXPENSES, ETC., FOR MAY AND JUNE, 1881.

## EARNINGS.

Passenger transportation.....	\$45,266 56
Freight transportation.....	82,242 74
Mail service.....	2,343 74
Express service.....	4,843 34
Other sources.....	18,549 88
Total earnings of line operated included in this report.....	\$153,246 26

## OPERATING EXPENSES.

Maintenance of way and structures....	\$17,595 40
Maintenance of cars .....	9,442 45
Motive power .....	7,583 85
Conducting transportation .....	32,864 22
Salaries included in above.	
Other general expenses of operating.....	8,188 29
Total operating expenses being, 49.38 per cent of earnings.....	75,674 21
Net earnings of 190.03 miles operated.....	77,572 05
Rentals paid, for use of road, track, depots, equipment, etc.....	50,000 00
Net income over operating expenses and rents paid.....	27,572 05

## OTHER PAYMENTS WITHIN THE YEAR.

Payments other than operating expenses and rentals :—Construction of new work.....	\$894 40
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## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Unpaid vouchers and pay-rolls .....	\$32,477 58
Amount due other railroads and individuals .....	22,202 95
Unpaid charges.....	291 33
Insurance receipts.....	7,041 64
Balance to credit income account.....	27,572 08
	<u>\$89,585 58</u>

## ASSETS.

Cash in hands of cashier.....	\$6,132 82
Amounts due from local agents and conductors .....	4,836 54
New round house at Columbus.....	894 40
Supplies on hand for current operations .....	40,962 96
Amounts due from other railroads and individuals .....	36,758 86
	<u>\$89,585 58</u>



ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30,  
1881.

The only accident of any moment was the turning over of an engine at a switch supposed to have been tampered with, resulting in the death of a fireman.

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*State of Indiana, County of Marion, ss.:*

C. E. Henderson, Asst. Gen'l Manager of the Indiana, Bloomington and Western Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

C. E. HENDERSON,

*Asst. General Manager.*

# CINCINNATI SOUTHERN RAILWAY.

## Report of Board of Trustees.

Name of road: Cincinnati Southern Railway.

By whom owned: City of Cincinnati.

By whom operated: The Cincinnati Railroad Company.

By what authority: Temporary license granted by Trustees of road.

Name of Board making this report: Board of Trustees Cincinnati Southern Railway.

General office at Cincinnati, O.

Principal office in Ohio at Cincinnati, O.

Address correspondence relating to this report to H. H. Tatem, Sec'y and Aud., at Cincinnati, Ohio.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

No change has occurred during year ending June 30, 1881, in the status of either the Board of Trustees, the railway, or the company operating the road.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Miles Greenwood.....	President.....	Cincinnati.....	\$1,000
H. H. Tatem.....	Secretary, Acting Treasurer and Auditor.....	".....	1,200
S. Woodward.....	Superintendent.....	".....	Paid by Co. oper- ating road
G. Bouscaren.....	Consulting and Principal Engineer.....	".....	3,600

## TRUSTEES.

Name.	Residence.	Name.	Residence.
Miles Greenwood.....	Cincinnati O.....	Henry Mark.....	Cincinnati.....
R. M. Bishop.....	".....	A. H. Bugher.....	".....
E. A. Ferguson.....	".....		

## FUNDED DEBT.

[Bonds authorized and issued by city of Cincinnati for construction of the railway.]

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Municipal.....	Statutory lien.....	July 1, 1872..	July 1, 1902...	7 3	\$9,300,000 00	\$9,300,000 00
" .....	" .....	" .....	" .....	7 7	700,000 00	700,000 00
" .....	" .....	May 1, 1876...	May 1, 1906...	7 6	3,200,000 00	3,200,000 00
" .....	" .....	" .....	" .....	7 3	2,800,000 00	2,800,000 00
" .....	" .....	Nov. 1, 1878...	Nov. 1, 1908...	7 7	1,000,000 00	1,000,000 00
" .....	" .....	Aug. 1, 1879...	Aug. 1, 1909...	6 7	1,000,000 00	1,000,000 00
" .....	" .....	July 1, 1881...	July 1, 1911...	4 4	16,000 00	16,000 00
Total.....	.....	.....	.....	.....	\$18,016,000 00	\$18,016,000 00

Average amount per mile of single main track (336 miles).. \$53,619 05

Proportion of same for Ohio (1,015 miles)..... 54,323 35

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1, 1881.
Right of way.....	\$650,193 98	\$1,134 61	\$651,328 59
Civil engineering.....	474,451 60	77,393 88	551,845 48
Preliminary surveys and expenses .....	185,656 08	.....	185,656 08
Grading and masonry .....	9,678,962 79	24,781 56	9,703,744 35
Bridges, trestles and viaducts .....	2,366,556 75	2,895 52	2,369,452 27
Cross-ties .....	357,579 73	7,573 93	365,153 66
Superstructure .....	458,890 89	22,819 33	481,210 22
Chairs and spikes .....	135,682 23	3,184 38	138,866 61
Fencing.....	38,480 40	1,246 38	39,726 78
Passenger and freight stations. ....	80,143 65	1,712 92	81,856 57
Engine and car houses.....	38,823 45	1,213 03	40,036 48
Machine shops*.....	16,021 96	953 22	16,975 18
Other buildings and fixtures .....	34,052 53	733 19	34,785 72
Telegraph .....	31,453 94	.....	31,453 94
Steel rails and iron rails †.....	2,011,262 07	62,565 08	2,073,827 15
Interest and commissions.....	116,393 44	.....	116,393 44
Contingent expenses .....	215,593 70	17,213 08	232,806 78
Rolling stock and tools .....	70,469 97	.....	70,469 97
Water and fuel stations.....	54,301 44	3,686 92	57,988 36
Total expenditures for construction	\$17,014,470 60	\$229,107 03	\$17,243,577 63

\* Machinery and fixtures in machine shops are furnished and paid for by the operating company.

† Inclusive of switch stands and fixtures.

## ROAD ACQUIRED BY PURCHASE.

Cincinnati, Lexington and East Tennessee R. R.—original cost (not of record) purchased for..... \$300,000 00

Total expended for construction and purchase ..... \$17,543,577 63

Average cost per mile of road constructed (single main track, 336 miles)	52,213 03
Average cost per mile of road owned by trustees (single main track, 336 miles).....	52,213 03
Proportion of same for Ohio (1.015 miles).....	52,996 23

## COST OF EQUIPMENT OWNED BY COMPANY.

60 push-cars .....	\$2,100 00
62 hand cars .....	3,100 00
All other rolling stock, tools, machinery, etc.....	26,750 00
<hr/>	
Total cost of railroad equipment owned by company.....	\$31,950 00
Additions within the year ending June 30, 1881.....	11,265 00
Average amount per mile (of single main track, 336 miles) .....	950 90
Proportion for Ohio (1.015 miles) .....	965 16
Total for road and equipment .....	17,575,527 63
Total average amount per mile (of single main track, 336 miles) .....	53,163 93
Proportion of same for Ohio (1.015 miles) .....	53,961 39

## CHARACTERISTICS, ETC.

## PROPOSED LINES.

From Cincinnati, Ohio, to Chattanooga, Tennessee ; 336 miles.  
Proposed gauge, 5 feet.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cincinnati, Ohio, to Chattanooga, Tennessee..	336 miles.	1.015
<hr/>		
Total single main track.....	336	" 1.015
Total length laid with rail computed as single track.....	223.04	" 1.015
Length in Ohio, distributed as follows: Hamilton county, main track, 1.015.		

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	5 feet.
Grade—Maximum per mile.....	79.2 feet.
Longest maximum.....	2611.2 feet.
Aggregate length of maximum.....	2611.2 feet.
Curvature—Shortest radius.....	478.37 feet.
Aggregate length of shortest radius.....	813.5 feet.
Aggregate length of all radii .....	622,450 feet.
Aggregate length of tangent.....	217.85 miles.
Rail—Iron—On road.....	153 miles.
Average weight per yard.....	60 lbs.
Steel—On road .....	223.4 miles.
Average weight per yard .....	60 and 53 lbs.

Ties—Average number per mile.....	2,640
Number laid during the year.....	28,916
Ballasted—On whole line .....	336 miles.
In Ohio.....	None.
With rock (mainly), gravel and cinders.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, none.

Iron..... 2; greatest age..... 4 years; aggregate length..... 1,287.2 feet.

Total..... 1,287.2 feet.

Trestles—3; greatest age, 4 years; greatest height, 58½ feet; greatest length, 2,775 ft.; aggregate length, 4,010 feet.

Length of shortest span of truss, ... ft.; of longest, .... ft.; greatest length of beams between points of support, if not trussed, 15 ft.

Greatest space between cross ties upon bridges and trestles, 4 inches; length of ties, 9 to 10 feet.

Number of track stringers, 8.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent person? Yes.

Tunnels—Stone, brick or wood: None.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	192.714	None.
Kind of fencing, as follows:		
Wire (average cost per rod, \$1.25).....	192.714	None.
Average cost of same per rod, \$1.25.		
Length of road unfenced, and the reason therefor: About 138 miles; want of funds.		

## CROSSINGS.

What railroads cross your road, either over or under grade in this State, and where? None,

Ohio and Mississippi Railroad, at Cincinnati.

Marietta and Cincinnati Railroad at Cincinnati.

Cincinnati, Hamilton and Dayton Railroad, at Cincinnati.

Cincinnati, Indianapolis, St. Louis and Chicago Railroad; at Cincinnati.

Cincinnati, Cleveland, Columbus and Indianapolis Railroad, at Cincinnati.

Number of crossings of highways at grade in this State at which there are gates or flagmen ..... 1

Number of crossings of highways over railroad..... 25

" " " under railroad ..... 4

Number of highway bridges 18 feet above track.... 25

Do all trains stop at railroad crossings as required by law? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated .....	202.7; in Ohio, 12
Miles of same owned by Trustees.....	67.9; " 4

## STATIONS.

Passenger and freight .....	88; in Ohio, 2
Number with telegraph communication.....	38; " 2
Number of same operated by railroad company .....	38; " 2
Is pay received for messages sent over line owned by railroad company ?	Yes.

## EMPLOYES.

Superintendents.....	1
Engineers.....	8
Laborers .....	525
Clerks.....	7
Firemen .....	8
Conductors ....	8
Brakemen.....	16
Section men.....	675
Other employes.....	29

Total number employed by Company in operating line.....	1,277
Proportion for Ohio.....	4

## DOINGS OF THE YEAR ENDING JUNE 30.

Rail laid—Steel.....	53 lbs. per yard; miles of track .....	1,387 5280
" .....	60 " " " " .....	32578 5280
New iron .....	60 " " " " .....	32304 5280
" .....	50 " " " " .....	3561 5280

*State of Ohio, County of Hamilton, ss.:*

Miles Greenwood, President of the Board of Trustees of the Cin. Southern Railway Co., being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of said Trustees, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said Trustees on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

MILES GREENWOOD.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 18th day of October, A. D. 1881.

[SEAL.]

W. T. PORTER,

*Notary Public for Hamilton Co.*

# CINCINNATI RAILROAD COMPANY, OPERATING CINCINNATI SOUTHERN RAILWAY.

Name of road : Cincinnati Southern Railway.  
 By whom owned : The city of Cincinnati.  
 By whom operated : The Cincinnati Railroad Company.  
 By what authority : License granted by trustees of road.  
 Name of company making this report : The Cincinnati Railroad Company.  
 General office at Cincinnati, O.  
 Principal office in Ohio at Cincinnati, O.  
 Address correspondence relating to this report to H. H. Tatem, Secretary and Treasurer, at Cincinnati, O.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

There has been no change in status of company since last report.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. H. Clement.....	President and Gen'l Man..	Cincinnati, O.....	\$5,000
R. S. Cunningham.....	Vice President.....	" .....	None.
H. H. Tatem .....	Secretary and Treasurer ...	" .....	\$2,400
R. S. Pomeroy .....	Auditor.....	" .....	1,800
S. Woodward.....	Superintendent .....	" .....	3,300
E. P. Wilson .....	Gen. Pas. and Fr'gt Agent	" .....	3,000
W. H. Clement.....	} Executive Committee. {	" .....	None.
B. S. Cunningham .....		" .....	"
W. J. Lippencott .....		" .....	"
A. H. Hinkle.....		" .....	"
G. H. Roots .....		" .....	"
Total salary .....			\$15,500

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Larz Anderson.....	Cincinnati, O.....	F. E. Roach.....	Cincinnati, O
R. S. Cunningham.....	" .....	G. H. Roots.....	"
W. H. Clement.....	" .....	A. H. Hinkle .....	"
* William Glenn .....	" .....	Jacob Seasongood.....	"
J. L. Heck .....	" .....	Briggs Swift .....	"
W. J. Lippencott .....	" .....	Jacob Wirth .....	"
James Rawson .....	" .....		



## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$5,000,000 00
Number of shares—common .....	100,000
Par value of each—common .....	\$50 00
Increase since June 30, 1880—common.....	3,900,000 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common.....	\$1,756,000 00
Amount subscribed—common.....	1,756,000 00
Total paid in capital stock—common .....	1,752,550 00
Increase since June 30, 1880—common.....	752,550 00

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.	Amount of preferred.
For subscriptions paid in cash .....	35,051	\$1,752,550	None.
Total .....	35,051	\$1,752,550	None.

Stockholders, residents of Ohio, 135.

Amount of stock held by them June 30, 1881, 34,782 shares, \$1,739,100.00.

Agents authorized to transfer stock: H. H. Tatem, Secretary and Treasurer, Cincinnati, O.

Number of shares transferred within the year at such agencies, 5,698.

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

Will be reported in returns of Trustees of the road.

## ROAD ACQUIRED BY PURCHASE.

Will be reported in returns of Trustees of the road.

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 54 .....	\$427,725 00
First-class passenger cars, 18.....	85,500 00
Second-class passenger cars, 5 .....	20,500 00
Box freight cars, 1350.....	556,050 00
Platform cars, 360 .....	101,110 00
Baggage cars, 13.....	27,440 00
Coal cars, 350 .....	144,571 50

Refrigerator cars, 60.....	\$39,950 00
Stock cars, 250 .....	111,000 00
Caboose cars, 32 .....	19,580 00
Directors and Superintendent's cars, 1.....	7,250 00
Pay cars, 1.....	4,100 00
Dump cars, 20 .....	8,840 00
Wrecking cars, 2 .....	1,423 57
All other rolling stock, tools, machinery, etc .....	32,263 18

Total cost of railroad equipment owned by company.....	\$1,587,303 25
Additions within the year ending June 30, 1881.....	614,057 24
Average amount per mile (of single main track, 336 miles) .....	4,724 12
Proportion for Ohio (1.015 miles).....	4,794 98

## CHARACTERISTICS, Etc.

## CROSSINGS.

C., H. & D. R. R. and M. C. R. R. at Cincinnati.

O. & M. R. R. and C., I., St. L. & C. R. R. at Cincinnati.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 1.

Number of crossings of highways over railroad, 25.

“ “ under railroad, 4.

Number of highway bridges 18 feet above track, 25.

Do all trains stop at railroad crossings as required by law? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated .....	2,027; in Ohio.....	12
Miles of same licensed to railroad company.....	679; “ .....	4

## STATIONS.

Passenger and freight.....	88; in Ohio.....	2
Number with telegraph communication .....	38; “ .....	2
Number of same operated by railroad company .....	38; “ .....	2
Is pay received for messages sent over line owned by railroad company? Yes.		

## ROLLING STOCK.

Locomotives.....	54; average weight—lbs., mch.incl.tender	106,000
Express and baggage cars.....	12; .....	38,000
Passenger cars .....	24; .....	47,750
Parlor and sleeping cars.....	4; .....	54,000
Freight cars.....	2,073; .....	18,325
Other cars—Caboose.....	29; .....	21,000
Officers .....	2; .....	53,000
Wrecking .....	2; .....	20,000

Above includes not owned by company reporting.

Parlor and sleeping cars..... 4; owned by Pullman Palace Co.

Terms of service: Railroad Company pays Pullman Palace Car Company 3 cents per car per mile run, and furnishes ice, fuel, lubricating material, etc., and cleans cars. When Car Company receives \$7,500 per annum per car from sale of seats and berths the 3 cents per car mileage ceases.

Number of locomotives equipped with train brakes, 52.

Kind of brake: Westinghouse Automatic.

Number of cars equipped with train brakes, 42.

Kind: Westinghouse Automatic.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Baker and Smith's heaters.

Means of lighting same: Signal oil lamps.

#### SPEED OF TRAINS.

Express passenger, average rate, including stops .....	30 miles per hour.
Mail and accommodation.....	26 "
Freight trains .....	12 "

#### EMPLOYES.

Superintendents.....	2
Telegraph operators .....	35
Engineers .....	66
Baggagemen .....	14
Flagmen, switch-tenders and watchmen .....	10
Laborers .....	55
Clerks .....	80
Train dispatchers.....	4
Firemen.....	66
Wipers.....	40
Mechanics .....	93
Conductors.....	55
Brakemen.....	141
Station Agents .....	73
Other employes .....	184

Total number employed by company in operating line..... 918

Proportion for Ohio.....  $8\frac{1}{10}$

#### EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams Express Co.

Terms: Forty per cent. of gross earnings.

AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Owing to age of road no data for this.

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—	Highest.	Lowest.
For distances less than 8 miles.....	3 Cts.	3 Cts.
For distances over 8 miles—1st class .....	3	3
2d class .....	2½	2
Emigrant .....	2½	2
Excursion.....	2½c. ea. way	1c. ea. way
Amount charged in addition to regular fares, in sleeping or other cars run on your road: For berth, \$2.00; section, \$4.00; state room, \$7.00.		

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton: See rates per ton per mile charged in proportion.

Rate per ton per mile on freight carried less than 30 miles:

	Highest.	Lowest.
First class.....	36 Cts.	14 Cts.
Second class.....	32	12
Third class .....	28	10
Fourth class.....	24	9
Fifth class.....	24	6
Special class.....	14	3

Rate per ton per mile on freight carried more than 30 miles:

First class.....	13	4
Second class.....	12	3½
Third class .....	10	3
Fourth class.....	9	2 <sup>8</sup> / <sub>10</sub>
Fifth class .....	7	2 <sup>3</sup> / <sub>10</sub>
Special class.....	5	¾

Rate per ton per mile for—

Coal—Carried ten miles or more.....	6	¾
Carried less than ten miles.....	6½	6½
Pig iron—Carried ten miles or more.....	6½	¾
Carried less than ten miles.....	6½	6½
Limestone—Carried ten miles or more.....	6½	¾
Carried less than ten miles.....	6½	6½
Iron ore—Carried ten miles or more.....	6	¾
Carried less than ten miles.....	6	6
Undressed stone or lumber—Carried 10 miles or more.....	6½	¾
Carried less than 10 miles.....	6½	6½

Rate per 100 lbs. for loading and unloading: Included in rates for transportation, except in cases of special contracts with consignor and consignee to load and unload at their own expense.

## DOINGS OF THE YEAR ENDING JUNE 30.

Train mileage—Passenger.....	537,691	
Freight .....	688,645	
Mixed .....	43,880	
Construction .....	71,390	
Total .....		1,341,606
Car mileage—Passenger.....	1,646,934	
Express and baggage.....	771,453	
Freight—loaded .....	10,791,268	
Freight—empty .....	2,573,214	
Caboose .....	732,525	
Construction and other.....	585,076	
Total.....		17,100,470
Fuel consumed—Wood, 597 $\frac{1}{2}$ cords; coal, 3,575 tons. Total cost.....		\$128,297 02
Losses, etc., paid—On goods and baggage .....		16,337 37
For injuries in Ohio, fatal and non-fatal:		
To employees.....	\$145 00	
To others .....	200 00	
Total.....		345 00

## TRANSPORTATION.

Passengers—Number carried, local .....	359,971	
through .....	16,316	
Total .....		376,287
Average number carried in each car per trip.....		30
Average number of miles traveled by each.....		52
Total mileage, or number carried one mile .....		19,372,298
Average amount received for each .....		114 cents.
Average amount <i>per mile</i> received for each .....		2 $\frac{2}{10}$ "
Freight—Tons carried, local.....	429,224	
through .....	198,373	
Total .....		627,597
Total movement, or tons carried one mile .....		77,103,174
Average amount received for each ton.....		229 cents.
Average amount <i>per mile</i> received for each ton .....		1 $\frac{9}{10}$ cents.
Average cost per ton freight per mile.....		.7
Articles transported:	Tons.	Per cent.
Coal .....	139,415	22.3
Stone, lime, sand, etc.....	10,480	1.7
Ores .....	14,436	2.3
Pig and bloom iron.....	40,722	6.5
Manufactured iron .....	18,592	2.9

Lumber and other forest products.....	111,468	17.8
Grain, flour, and other agricultural products.....	107,506	17.1
Live stock.....	58,175	9.3
Animal products .....	26,960	4.3
Manufactures, including agricultural implements .....	18,347	2.9
Merchandise .....	10,668	1.7
Miscellaneous .....	70,828	11.2

Total tonnage yielding revenue .....	627,597	100.
Supplies for company's use.....	5,915	

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation.....	\$942,160	38
Freight transportation .....	1,439,641	20
Mail service.....	24,843	76
Express service .....	38,501	88
Other sources .....	50,340	15

Total earnings of line operated included in this report.....\$1,982,487 57

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$443	38
Maintenance of cars .....	75,777	89
Motive power.....	318,480	97
Conducting transportation .....	345,704	00
General expenses:		
Taxes in Ohio.....	\$75	52
Salaries .....	70,607	45
Other general expenses of operating.....	41,977	35
	<u>\$112,660</u>	<u>32</u>

Total operating expenses, being 43 per cent. of earnings .....	\$853,066	56
Net earnings of 336 miles operated ..	1,129,421	01
Rentals paid (for use of road, track, depots, equipments), etc.....	1,034,412	25
Net income over operating expenses and rents paid.....	95,008	76
Percentage of same to capital stock and debt, 5 $\frac{1}{10}$ ..		
Per mile of earnings, \$5,900.26; proportion for Ohio (1.015 miles)..	5,988	76
operating expenses, \$2,538.89; proportion for Ohio.....	2,576	97
net earnings, \$3,361.37; proportion for Ohio .....	3,411	79

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock .....	\$752,550	00
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Additional equipment..... \$614,057 24

Under company's license it receives 7 per cent. interest per annum on its capital actually paid in, payable out of earnings of road. Balance of earnings, after payment of operating expenses, is paid to the Trustees of the Railway as and for rent, consequently no "dividends" are paid.

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$1,752,550 00	
Rent of roadway .....	95,244 85	
Accounts payable .....	16,093 29	
		\$1,863,888 14

## ASSETS.

Equipment.....	\$1,587,303 25
Office and Station furniture.....	11,910 13
Material and fuel on hand .....	34,015 88
Due from railroad companies, agents, etc.....	85,545 90
Cash.....	145,112 98
	\$1,863,888 14

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1880.				
July 6	Unknown man....	Unknown .....	Crossing track in front of advancing engine.....	Leg broken.
25	Walter Miranda...	Brakeman .....	Fell from train while moving.....	
Aug. 25	Pat. Collins .....	Laborer .....	Refused to get out of way, and bale of cotton fell on him .....	Killed.
Sept. 10	Stephen Darter ...	Yardman .....	Fell from engine moving in yards.....	Killed.
				Killed.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Falling or thrown from engine or train .....	2
Others—Miscellaneous .....	1
Total.....	3

## PERSONS INJURED—CAUSES.

Others than passengers or employees—Lying, walking, or being on track.....	1
Total.....	1



## RECAPITULATION.

Killed—Employees—from misconduct or want of caution .....	2
Others—at stations and highway crossings .....	1
Total killed .....	3
Injured—Others—at stations and highway crossings.....	1
Total injured .....	1

## TRAIN ACCIDENTS—ENTIRE LINE.

Number.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880. July 23	Near Glenmary .....		Mistake in orders.....	One man hurt and several draw-bars broke.
2	Sept. 21	" Coulterville, Tenn	Freight.....	Draw-head pulled out...	End of freight car and several draw-heads broken.
3	Oct. 28	" Waynesburg, Ky..	Freight.....	Rear end collision, train running too fast.....	Engine disabled; end of car and platform of caboose broken.
4	Nov. 7	" Williamstown, Ky	Passenger.....	Broken rail.....	Two coaches and one sleeper thrown off track, scratching them and break'g windows; bruised 1 passenger.
5	Dec. 6	" Greenwood, Ky...	Freight .....	Switch left open.....	One car demolished and ends of 2 others broke.
6	4	" Dry Ridge, Ky.....	Freight .....	Struck a calf.....	Ditched 3 cars, 2 of which were totally wrecked.
7	1881. Jan. 10	" Coulterville, Tenn	Freight .....	Rail taken out by section men and not suffic'tly protected; train also running too fast.....	Engine and six cars thrown from track, but slightly damaged.
8	July 20	" Annadel, Tenn.....	Freight .....	Broken wheel.....	Ditched 2 stock cars; killed 23 mules.
9	Feb. 4	" Hinton, Ky .....	Passenger.....	Rail broken under train	Broke windows of two coaches and slightly injured 1 passenger.
10	11	" Sloan's Valley, Ky	Freight .....	Slide.....	Wrecked 4 cars; killed 1 brakeman.
11	21	" Pine Knot, Ky.....	Freight .....	Rear end collision; 2d sect'n running too fast	Wrecked 3 cars and caboose.
12	April 17	" Emory Gap, Tenn.	Freight.....	Broken wheel .....	Broke 1 axle, 5 brake beams and 1 truck.
13	27	" Cincin'ti, O., yard.	Freight .....	Bent axle.....	Three cars thrown from track and demolished.
14	May 16	" Somerset, Ky.....	Freight .....	Broken wheel.....	Several cars thrown from track; damage slight.
15	June 5	" Milville, Tenn.....	Freight.....	Obstructed frog.....	Twelve cars ditched; considerably damag'd.

## SUMMARY OF TRAIN ACCIDENTS.

Number:

Accidents causing derailment of trains.....	11
Accidents not resulting in derailment of train.....	1
Collisions—butting.....	1
rear.....	2
Total accidents .....	15

## Causes of accidents effecting derailment of trains:

Axle bent.....	1
Frog obstructed .....	1
Broken rail.....	2
Broken wheel .....	3
Cattle on track .....	1
Falling mass.....	1
Misplaced switch—carelessness.....	1
Rail removed for repairs .....	1
Total.....	11

## Causes of collisions:

Misplaced switch .....	1
Running carelessly .....	2
Total.....	3

## Causes of accidents not resulting in derailment of trains:

Other causes—draw-head pulled out.....	1
Total derailments.....	11
Total collisions .....	3
Total accidents .....	15

*State of Ohio, County of Hamilton, ss.:*

William H. Clement, President of the Cincinnati Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

W. H. CLEMENT.

[SEAL OF R.R.]

Subscribed and sworn to before me, this 29th day of October, A. D. 1881.

W. T. PORTER,

[SEAL.]

Notary Public, Hamilton County, O.

# CINCINNATI AND SPRINGFIELD RAILROAD COMPANY.

Name of road: Cincinnati and Springfield Railroad.

By whom operated: C. C. C. & I. R'y Co.

Name of company making this report: C. C. C. & I. R. R. Co.

General office at Cleveland, O.

Principal office in Ohio at Cleveland.

Address correspondence relating to this report to A. Ely, Auditor, Cleveland, O.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

H. B. Hurlbut, President, Cleveland, Ohio.

## CAPITAL STOCK.

### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$5,000,000 00
Par value of each—common.....	100 00
Amount subscribed—common.....	\$1,100,000 00
<hr/>	
Total paid in capital stock—common .....	1,100,000 00
Average amount paid in per mile of single main track (48.05 miles) ...	22,892 82
Proportion of same for Ohio (48.05 miles).....	1,100,000 00

### CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For original construction—No. shares .....	11,000
Stockholders, residents of Ohio.....	14
Amount of stock held by them June 30, 1881.....	\$724,600 00

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
First mortgage.....			Apr. 1, '91	7	\$2,000,000	\$2,000,000
Second ".....			Jan. 1, '92	7	1,000,000	651,000
Total .....						\$2,651,000

Average amount per mile of single main track (48.05 miles) .....	\$55,171 70
Proportion of same for Ohio .....	2,651,000 00

## OTHER INDEBTEDNESS.

Total unfunded debt.....	\$1,667,291 77	
Net unfunded debt.....		\$1,667,291 77
Average amount per mile of single main track.....	\$11,617 71	
Total net debt liabilities.....		4,318,291 77
Total of paid in stock and debt.....		5,418,291 77
Total average amount per mile .....	\$113,777 80	
Proportion of same for Ohio .....	5,418,291 77	

## COST OF ROAD EQUIPMENT, ETC.

Total expenditures for construction.....	\$3,100,000 00
Total cost of railroad equipment owned by company .....	651,000 00
Total for road and equipment .....	3,751,000 00
Total average amount per mile of single main track (48.05 miles).....	78,064 52
Proportion of same for Ohio.....	3,751,000 00

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—Ludlow Grove to Dayton.....	48.05 miles	48.05 miles.
Aggregate of sidings and other tracks.....		14.46
Total length laid with rail computed as single track ..	62.51	62.51
Length laid with steel rail.....	48.05	48.05
Length in Ohio distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Montgomery .....	13.41	2.10	15.51
Warren.....	4.32	1.24	5.56
Butler.....	19.74	4.13	23.87
Hamilton .....	10.58	6.99	17.57
Totals .....	48.05	14.46	62.51
Steel rail .....	48.05		

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPOt.

	Length.	In Ohio.
Cincinnati and Baltimore Railway.....	6.23 miles.	
Cincinnati and Indiana “ .....	1 33	
P., C. & St. L. “ .....	1.25	
C., S. & C. “ .....	23.34	
Total single track.....	32.15	32.15

Sidings and other tracks.....	7.06	7.06
Total.....	39.21	39.21

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4 feet, 8½ in.
Grade—Maximum, per mile.....	40 feet.
Curvature—Shortest radius .....	1,432 "
Aggregate length of all radii .....	91,872 "
Aggregate length of tangent .....	55.20 miles.
Rail—Steel—On road.....	80.20 miles.
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	2,640.
Ballasted—On whole line.....	All.

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 20; greatest age, 8 years; aggregate length, 2,910 feet.	
Iron, 5; aggregate length, 508 feet.	
Stone arch, 1; aggregate length, 20 feet.	
Total .....	3,438 feet.
Length of shortest span of truss, 24 feet; of longest, 152 feet.	
Greatest space between cross ties upon bridges and trestles, 12 inches; length of ties, 8 feet 6 inches.	
Number of track stringers, 2.	
Are all bridges and trestles provided with guard rails? No.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Monthly.	
Are the examinations analytical, and are they made by a competent person? Yes.	

## Fencing—Average and Aggregate Cost.

	Whole Line.	In Ohio
Number miles fencing, computed as single line.....	All.	All.
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.10)		
Wire (average cost per rod, \$.85)		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

N. Y., P. & O. Railway, at Dayton.

C., H. & D. Railroad, "

D. & W. " "

D. & M. " "

D. & U. " "

Number of crossings of highways at grade in this State without protection, 115.

" " over railroad, 1.

Do all trains stop at R. R. crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Capital stock.....	\$1,100,000 00	
1st mortgage bonds.....	2,000,000 00	
2nd       “.....	651,000 00	
C., C., C. & I. Railway advances.....	1,667,291 77	
Total.....		\$5,418,291 77

## ASSETS.

Railway equipment and real estate.....	\$3,751,000 00	
Loss in operating.....	1,667,291 77	
Total.....		5,418,291 77

*State of Ohio, County of Cuyahoga, ss.:*

E. B. Thomas, General Manager of the Cincinnati and Springfield Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

E. B. THOMAS,

[SEAL OF R. R.]

*General Manager C., C., C. & I. R'y—Lessee.*

Subscribed and sworn to before me this 7th day of October, A. D. 1881.

[SEAL.]

J. T. WANN, *Notary Public.*

CLEVELAND, COLUMBUS, CINCINNATI AND INDIANAPOLIS  
RAILWAY COMPANY OPERATING CINCINNATI AND  
SPRINGFIELD RAILROAD.

Name of road: Cincinnati and Springfield Railroad.  
By whom operated: C., C., C. and I. Railway Company.  
By what authority: Lease.  
General office at Cleveland, Ohio.  
Principal office in Ohio at Cleveland, Ohio.  
Address correspondence relating to this report to A. Ely, Auditor, at Cleveland, O.

CHARACTERISTICS, ETC.

LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Cincinnati & Springfield R'y.....	80.20 miles.	80.20 miles.
Total single track .....	80.20 miles.	80.20 miles.
Sidings and other tracks.....	21.52 miles.	21.52 mile.
Total .....	101.72 miles.	101.72 miles.

CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

N. Y., P. & O. R'y at Dayton.  
C., H. & D. R. R. at “  
D. & U. R. R. at “  
D. & W. R. R. at “  
D. & M. R. R. at “

Number of crossings of highways at grade in this State without protection..... 115  
“ “ “ over railroad..... 1

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

STATIONS AND TELEGRAPH.

TELEGRAPH LINE.

Miles on line of road operated ..... 80.2; in Ohio, 80.2



## STATIONS.

Passenger and freight .....	22; in Ohio, 22
Number with telegraph communication .....	16; " 16
Number of same operated by railroad company .....	16; " 16
Is pay received for messages sent over line owned by railroad company? No.	

## ROLLING STOCK.

Locomotives .....	16; Average weight.....	60,000 lbs.
Express and baggage cars.....	6; .....	29,000 "
Passenger cars .....	15; .....	36,000 "
Parlor and sleeping cars .....	1; .....	29,000 "
Freight cars.....	275; .....	16,000 "
Other cars .....	10; .....	21,000 "

Number of locomotives equipped with train brakes: None.

Number of cars equipped with train brakes, 22.

Kind: Westinghouse Air Brake.

Number of passenger cars with "Miller Platform," 22.

Are all cars run on this road heated and lighted as prescribed by law? We think so.

State methods of heating cars used for the transportation of passengers: Winslow and Baker Heating Stoves.

Means of lighting same: 300 % oil.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	32 miles per hour.
Mail and accommodation, .....	25 "
Freight trains, .....	10 "

## EMPLOYEES.

Superintendent .....	1
Telegraph operators .....	22
Engineers.....	44
Baggagemen .....	13
Flagmen, switch-tenders and watchmen .....	55
Laborers .....	142
Clerks.....	51
Train dispatchers .....	3
Firemen .....	49
Wipers.....	21
Mechanics.....	68
Conductors .....	26
Brakemen .....	55
Station agents .....	18
Section men.....	88
Other employees.....	12

---

Total number employed by company in operating line..... 668

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road:

American and United States Express Companies.

Terms:

About double first-class freight rates.

Special freight and transportation lines:

White Line.

Hoosac Tunnel Line.

South Shore Line.

Merchants' Dispatch Transportation Company.

Great Western Dispatch.

Terms as to rates, use of track, machinery, repair of cars, etc., with each:

White Line, Hoosic Tunnel Line, South Shore Line and Great Western Dispatch owned by the different railways in the lines, and are co-operative.

Merchants' Dispatch Transportation Company—about 9% of the business done

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—

	Highest.	Lowest.	Average.
For distances less than 8 miles.....	10 Cts.	3 Cts.	3 Cts.
For distances over 8 miles—First class.....	3	1	1.8
Second class .....	2	$\frac{3}{4}$	1
Emigrant .....	1	$\frac{1}{2}$	$\frac{3}{4}$
Excursion .....	2	$\frac{1}{2}$	$\frac{3}{4}$

## FREIGHT.

Rates are fixed by Ohio State law for 30 miles and under.

Rates for over 30 miles, dependent on distance; no fixed basis.

No changes made for loading or unloading.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length.
No. 28, Cincinnati Division.....	Howe Truss.....	Stone .....	73 feet.

Fencing in Ohio—Miles of single fence built,  $4\frac{8}{10}$ .

Rail laid—Steel,  $6\frac{1}{2}$ ..

Train mileage—Passenger.....	357,701
Freight.....	242,663
Construction .....	8,484

Total ..... 608,848

Car mileage—Passenger.....	1,012,337	
Express and baggage.....	441,389	
Freight—loaded.....	5,040,263	
empty.....	2,371,889	
	<hr/>	7,412,152
Caboose .....		307,719
Construction and other .....		12,912
	<hr/>	
Total.....		9,186,509
Fuel consumed—Wood, 810 cords; coal, 22,546 tons; total cost .....		\$47,248 93
Losses, etc., paid—On goods and baggage .....		7,226 98
For injuries in Ohio, fatal and non-fatal:		
To passengers .....	\$2,500 00	
To employes .....	904 35	
To others.....	103 75	
	<hr/>	
Total.....		\$3,508 10
For animals killed in Ohio:		
Horses, 2.....	\$95 00	
Mules, 4 .....	135 00	
Cattle, 6.....	97 50	
Sheep, 1 .....	4 00	
Hogs, 3.....	19 00	
	<hr/>	
Total .....		\$350 <sup>5</sup> / <sub>10</sub>
Amount claimed in litigation, etc., for injuries in Ohio to persons:	Unknown.	

## TRANSPORTATION.

Passengers—Number carried, local.....	432,954	
through.....	87,971	
	<hr/>	
Total.....		520,925
Average number carried in each car per trip .....		30
Average number of miles traveled by each.....		27
Total mileage, or number carried one mile.....		14,043,804
Average amount received for each.....		57 <sup>1</sup> / <sub>10</sub> cents.
Average amount <i>per mile</i> received for each.....		2.119 cents.
Freight—Tons carried, local.....	383,369	
through .....	595,024	
	<hr/>	
Total .....		978,393
Average tons in each loaded car per trip .....		10
Average tons in each loaded car per mile.....		10
Total movement, or tons carried one mile.....		54,998,700
Average amount received for each ton.....		68 <sup>8</sup> / <sub>10</sub> cents.
Average amount <i>per mile</i> received for each ton.....		1.223 cents.
Average cost per ton freight per mile .....		.590 cents.
Average amount received for each ton through freight.....		61 <sup>1</sup> / <sub>10</sub> cents.
Average amount received for each ton local freight .....		80 <sup>1</sup> / <sub>10</sub> cents.

## Articles transported :

Articles transported :	Tons.	Per cent.
Coal .....	155,785	15.9
Stone, lime, sand, etc.....	26,440	2.7
Petroleum .....	20,656	2.1
Ores .....	4,150	.4
Manufactured iron.....	38,149	3.9
Lumber and other forest products.....	95,387	9.8
Grain, flour, and other agricultural products.....	170,465	17.4
Live stock .....	43,192	4.4
Animal products .....	21,415	2.2
Manufactures, including agricultural implements.....	96,752	9.9
Merchandise .....	306,002	31.3
Total tonnage yielding revenue.....	978,393	100
Supplies for company's use .....	20,367	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

### EARNINGS.

Passenger transportation—local .....	\$159,865	24
through .....	137,702	97
Total .....		\$297,568 21
Freight transportation—local .....	\$307,127	42
through .....	365,705	00
Total .....		\$672,832 42
Mail service.....		21,627 58
Express service.....		25,601 22
Total earnings of line operated included in this report.....		\$107,629 43

OPERATING EXPENSES.

Maintenance of way and structures .....	\$127,702	94
Maintenance of cars.....	36,628	97
Motive power.....	29,065	10
Conducting transportation.....	384,133	31
General expenses:		
Taxes in Ohio .....	17,262	92
Salaries .....	24,293	60
Other expenses of operating .....	43,813	98
	<hr/>	
Total operating expenses, being 65.14 per cent. of earnings.....	\$662,901	02
Net earnings of 80.2 miles operated .....	354,728	41

## Rentals paid (for use of road, track, depots, equipment), etc.:

Cincinnati & Baltimore R'y Co.....	\$35,000 00	
Cincinnati & Indiana R'y Co.....	44,273 76	
Cincinnati, Sandusky & Cleveland R'y Co .....	97,499 19	
	<hr/>	\$176,772 95

Net income over operating expenses and rents paid ..... 177,955 46

Percentage of same to capital stock and debt,  $3\frac{2}{100}\%$ .

Percentage of to total means applied to construction, etc.,  $4\frac{7}{100}\%$ .

Per mile of earnings, \$12,688.65; proportion for Ohio (80.2 miles) ..... 1,017,629 43

operating expenses, \$8,265 60	"	662,901 02
net earnings, \$4,423 05	"	354,728 41

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt..... \$12,117 83

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) ..... \$185,779 98

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$1,100,000 00
First mortgage bonds.....	2,000,000 00
Second mortgage bonds.....	651,000 00
C., C., C. & I. R'y, advances.....	1,667,291 77
	<hr/>
	\$5,418,291 77

## ASSETS.

Railway equipment and real estate.....	\$3,751,000 00
Loss in operating.....	1,667,291 77
	<hr/>
	\$5,418,291 77

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

Order	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880.				
1	June 14	Mrs. Crump.....	.....	Jumping off moving train.....	Nose and face badly bruised.
2	June 30	Jno. Dillon.....	Brakeman.....	Lying asleep on main track.....	Arm broken and internally injured.
3	July 22	Edward Smith.....	.....	Attempting to pass crossing in face of approaching train.....	Seriously injured.
3	.....	Edward Mund.....	.....	Attempting to pass crossing in face of approaching train.....	Slightly injured.
4	Sept. 20	O. L. Flennen.....	Brakeman.....	Struck by overhead bridge.....	Killed.
5	.....	Wm. Ebernich.....	.....	Threw himself under train (suicide)...	Arm mashed.
6	Nov. 17	John English.....	Brakeman.....	Caught between deadwood.....	Badly hurt.
7	.....	F. D. Thayer.....	.....	Brake-wheel broke.....	.....
8	.....	Chas. Kishler.....	Conductor.....	Falling from top of car.....	Hand mashed.
9	Dec. 3	Wm. Miller.....	Brakeman.....	Carelessness in coupling cars.....	Ribs broken.
10	.....	Paul Betzler.....	.....	.....	Killed.
11	.....	Geo. O. White.....	.....	Lying on track intoxicated.....	.....
12	.....	Lawrence Whaler.....	Switchman.....	Carelessness in "rolling cars".....	Hand mashed.
13	.....	E. F. McCoy.....	Brakeman.....	Slipped on rail while coupling.....	Killed.
	1881.				
14	Jan. 19	Thomas Murphy.....	.....	Carelessness.....	Hand mashed.
15	.....	John Murray.....	.....	Coupling cars.....	Fingers mashed.
16	.....	A. E. Hart.....	.....	Carelessness in coupling cars.....	Hand mashed.
17	.....	S. Latherby.....	Foreman.....	Nut slipping off brake wheel.....	Knee and internally.
18	.....	John Bolin.....	Bridgeman.....	Struck by bridge while riding on top of a freight train.....	Two ribs broken.
19	Apr. 2	Jas. Farrell.....	Stone-cutter.....	Lying on track drunk.....	Leg cut off.
20	May 18	Wm. Cassatt.....	Brakeman.....	Fell from top of car.....	Ankle sprained.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Struck by bridge, chute, or other obstruction.....	1
Miscellaneous .....	1
Others—Lying, walking, falling, or being on track.....	1
Suicide .....	1

## PERSONS INJURED—CAUSES.

Passengers—Getting on or off engine or train in motion .....	1
Employees—Struck by bridge, chute, or other obstruction .....	2
Coupling, or caught between cars and engine.....	4
Falling or thrown from engine or train .....	2
Lying, walking, falling, or being on track .....	3
Run over, catching foot in frog or between rails.....	1
Breaking of brake rod, chain or wheel in setting.....	1
Others—Driving or riding across track.....	2
Lying, walking, falling, or being on track .....	1
Total .....	17

## RECAPITULATION.

Killed—Employees—from misconduct or want of caution.....	2
Others—trespassing on track, etc.....	2
Total killed .....	4
Injured—Employees—from causes beyond their control .....	2
misconduct or want of caution .....	12
Others—At stations and highway crossings.....	2
trespassing on track, etc .....	1
Total injured.....	17

## TRAIN ACCIDENTS—ENTIRE LINE.

*Return of accidents to trains occurring within the year ending June 30, 1881.*

Number.	Date.	Place.	Character of train.	Causes of accident.	Effect of accident.
1	Sept. 3	Cincinnati.....	Freights.....	Collision caused by misplaced switch .....	Engine damaged.
2	Oct. 25	" .....	" .....	Collision .....	" .....
3	Jan. 7	Dayton .....	" .....	" .....	" .....
4	22	" .....	" .....	" .....	Engine and several cars damaged.
5	29	Brighton .....	" .....	" .....	Engine damaged.
6	Feb. 14	Cincinnati.....	" .....	Running through an open switch .....	" .....
7	Apr. 10	" .....	" .....	Switch set wrong on M. & C. ....	Cars .....
8	May 2	Alexanderville.....	Passenger .....	Cow on track.....	Engine, two baggage cars and smoker slightly damaged.
9	2	Dayton .....	Freight.....	Jumping point of crossing frog.....	Some cars badly damaged.
10	5	Irwin .....	Freights.....	Collision.....	Some cars badly damaged.



## SUMMARY OF TRAIN ACCIDENTS.

Number accidents causing derailment of trains.....	1
accidents not resulting in derailment of train .....	3
collisions—Butting .....	1
Rear .....	5
<hr/>	
Total accidents.....	10
Causes of accidents effecting derailment of trains :	
Cattle on track .....	1
Causes of collisions :	
Misplaced switch.....	2
Other causes .....	4
<hr/>	
Total.....	6
Causes of accidents not resulting in derailment of trains :	
Other causes .....	3
<hr/>	
Total .....	3
Total derailments.....	1
Total collisions .....	6
Total accidents .....	3
<hr/>	
	10

*State of Ohio, County of Cuyahoga, ss. :*

E. B. Thomas, General Manager of the Cincinnati & Springfield Railway Company, Cleveland, Columbus, Cincinnati & Indianapolis Railway Company Lessee, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed) E. B. THOMAS, *Gen'l Manager C. C. C. & I. R'y Lessee.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 7th day of October, A. D. 1881.

J. T. WANN,

[SEAL.]

*Notary Public.*

# CINCINNATI, VAN WERT AND MICHIGAN RAILWAY COMPANY.

From March 5, 1881, to June 30, 1881.

Name of road: Cincinnati, Van Wert and Michigan Railroad.  
By whom owned: Cincinnati, Van Wert and Michigan Railroad Co.  
By whom operated: Cincinnati, Van Wert and Michigan Common Carrier Company.  
By what authority: Construction contract.  
Name of company making this report: C. V. W. & M. R. R. Co.  
General office at Van Wert, O.  
Principal office in Ohio at Van Wert, O.  
Address correspondence relating to this report to Henry Butler, President, at Van Wert, O.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Cincinnati, Van Wert and Michigan Railroad Company was incorporated under the general law January 26, 1881, to construct a railroad from Cincinnati to the Michigan State Line via Van Wert, Ohio. It acquired, by purchase, under section 3409, general railroad law, the Celina, Van Wert and State Line Extension of the Columbus and Northwestern Railway, March 5, 1881.

The Celina, Van Wert and State Line Extension of the Columbus and Northwestern Railway was completed as a narrow guage railroad from Van Wert to the south line of Van Wert county, February 24, 1880.

The Cincinnati, Van Wert and Michigan Railroad operates, under perpetual lease, the Dublin Township Railroad, extending from connection with the C. V. W. & M. R. R., at north line of Mercer county, to Shane's Crossing.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
H. Butler.....	President .....	Van Wert, O.....	.....
Ira P. Shissler.....	Secretary .....	" .....	.....
W. H. Pennell.....	Treasurer.....	" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
H. Butler. ....	Van Wert, O. ....	A. B. McCurdy.....	Van Wert, O.
T. S. McKine.....	" .....	H. C. McGarren.....	" .....
L. Patterson.....	" .....	I. N. Alexander.....	" .....
J. Clark.....	" .....	H. Van Tilburg.....	Shane's Cross'g
W. H. Pennell.....	" .....	Peter Frysinger.....	" .....
A. B. Gleason.....	" .....		

## CAPITAL STOCK.

Capital stock authorized by law :

Amount—common .....	\$2,000,000 00
Number of shares—common .....	40,000
Par value of each—common.....	\$50 00

Capital stock authorized by vote of company—common ..... 1,200,000 00  
 preferred ..... 1,200,000 00

## FUNDED DEBT.

Kind of bond or obligations—first mortgage—Rate of interest, 6 per cent.; amount of authorized issue, \$1,200,000; amount actually issued, \$195,000.

Kind of bond or obligations—Income bonds—Rate of interest, 6 per cent.; amount of authorized issue, \$1,200,000; amount actually issued, \$195,000.

Average amount per-mile of single main track (13 miles), \$30,000.

## COST OF ROAD EQUIPMENT.

Road under construction.

## ROAD ACQUIRED BY PURCHASE.

Celina, Van Wert and State Line extension of the Columbus and Northwestern R'y ;  
 \$200,000 stock.

## EQUIPMENT OWNED BY COMPANY.

1 locomotive; 1 first-class passenger car; 1 box freight car; 10 platform cars; 1 baggage car; 2 hand cars.

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Cincinnati via Van Wert, O., to Michigan State Line.

Length graded, not laid with rail, 10 miles.

State on what portion of the line: From Van Wert north.

Proposed gauge, 4 feet 9 inches.

## LINE IN OPERATION.

	Length.
Single main track, Van Wert to Shane's Crossing .....	13 $\frac{1}{10}$
Aggregate of sidings and other tracks.....	1 $\frac{23}{10}$

Total length laid with rail computed as single track..... 13 $\frac{8}{10}$   
 Length in Ohio, distributed as follows:

County.	Main track.
Van Wert .....	10.375
Mercer .....	2 $\frac{7}{10}$
Total .....	13.075

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

Dublin Township Railroad .....	Length. 2 $\frac{7}{10}$
--------------------------------	-----------------------------

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 9 inches.
Grade—Maximum, per mile.....	39.6
Longest maximum.....	1 $\frac{1}{2}$ miles.
Curvature—Shortest radius.....	955.37 feet.
Aggregate length of tangent.....	12.6 miles.
Rail—Steel—On road.....	13.1 "
Average weight per yard .....	45 pounds.
Ties—Average number per mile .....	2,600
Ballasted—On whole line .....	13.1 miles.
With dirt.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 1; greatest age, 1 year; aggregate length..... 56 feet.  
 Trestles—2; greatest age, 2 years; greatest height, 12 feet; greatest length, 300;  
 aggregate length, 372 feet.

Length of shortest span of truss, 56 ft.; of longest, 56 ft.; greatest length  
 of beams between points of support, if not trussed, 15 ft.

Greatest space between cross ties upon bridges and trestles, 10 inches;  
 length of ties, 8 feet.

Are all bridges and trestles provided with guard rails? No.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent per-  
 son? Yes.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality? Toledo, Delphos and Burlington Railroad, at Enterprise, O.

Do all trains stop at R. R. crossings as required by law? Yes.

## STATIONS AND TELEGRAPH.

## STATIONS.

Passenger and freight (number) ..... 5; in Ohio... All.

## EMPLOYEES.

Superintendents.....	1
Engineers.....	1
Flagmen, switch-tenders and watchmen .....	2
Conductors.....	1
Brakemen.....	1
Station agents.....	2
Section men.....	10
Proportion for Ohio.....	18

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American Express Co.

Terms: \$25.00 per month.

## ROLLING STOCK.

Locomotives (average weight, 64,000 lbs) .....	1
Express and baggage cars.....	1
Passenger cars.....	1
Freight cars .....	11

Number of locomotives equipped with train brakes, none.

Number of cars equipped with train brakes, none.

Number of passenger cars with "Miller Platform," 1.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Stoves.

Means of lighting same: Candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	15 miles per hour.
Mail and accommodation, " .....	15 "
Freight trains, " .....	15 "

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—	Highest.	Lowest.	Average.
For distances less than 8 miles .....	3 Cts.	3 Cts.	3 Cts.
Over 8 miles—Excursion.....	2½	1½	1¾

## FREIGHT.

Rates: We use at present classification and rates of the Pittsburgh, Ft. Wayne and Chicago railroad.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Rail laid—new iron, 45 pounds per yard.

Fuel consumed—wood, 600 cords.

## EARNINGS, OPERATING EXPENSES, Etc, FOR MAY AND JUNE 1881.

## EARNINGS.

Passenger transportation—local.....	\$1,047 40
Freight transportation—local.....	821 59
Mail service.....	271 68
Express service .....	77 75

Total earnings of line operated included in this report.....	\$2,218 42
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## OPERATING EXPENSES.

Maintenance of way and structures.....	\$390 53
Maintenance of cars.....	79 55
Motive power .....	408 78
Conducting transportation .....	210 25
Other general expenses of operating.....	20 00

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\$1,109 11

Total operating expenses, being 50 per cent. of earnings.....	\$1,109 11
---	------------

Net earnings of 13.1 miles operated.....	\$1,109 31
The gross earnings of the Celina, Van Wert and State Line extension for 11 months, ending April 30, 1881.....	\$9,083 96
Expenses.....	8,818 45
Net .....	\$265 51

*State of Ohio, County of Van Wert, ss.:*

Henry Butler, President of the Cincinnati, Van Wert and Michigan Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

HENRY BUTLER.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 27th day of August, A.D. 1881.

[SEAL.]

F. L. HAMMER,

*Notary Public.*

## CINCINNATI AND WESTWOOD RAILROAD COMPANY.

Name of road: Cincinnati & Westwood Railroad.

By whom owned: Cincinnati & Westwood Railroad Company.

By whom operated: Cincinnati & Westwood Railroad Company.

By what authority: Charter.

Name of person making this report: F. W. Schwartz, President of Cincinnati & Westwood Railroad Company.

General office at No. 11 Main street, Cincinnati, Ohio.

Principal office in Ohio at Cincinnati, Ohio.

Address correspondence relating to this report to C. Werk, Treasurer, at No. 11 Main street, Cincinnati, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

On the 16th day of May, 1874, the company was organized for the purpose of operating a narrow gauge railroad between Cincinnati and a point on or near the farm of James Robb, Esq., in Green township, Hamilton county, Ohio, and on the 20th day of May, 1874, a charter was granted. The construction of the road was pushed forward as rapidly as possible, and on the 22d day of May, 1876, the company commenced running trains for the accommodation of passengers regularly.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
F. W. Schwartz	President	Cheviot, Hamilton Co	
M. Schwartz	Vice-President	Cincinnati, O.	
J. S. Weatherby	Secretary	"	
C. Werk	Treasurer	"	
M. Werk	General Manager	"	

### DIRECTORS.

Name.	Residence.	Name.	Residence.
F. W. Schwartz	Cincinnati, O.	Henry Brachmann	Cincinnati, O.
M. Schwartz	"	S. H. Foster	"
C. Werk	"	J. S. Weatherby	"
Thos. Morgan	"		



## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$100,000 00
Number of shares—common.....	2,000
Amount subscribed—common.....	69,500 00
Total paid in capital stock—common.....	69,500 00
Average amount paid in per mile of single main track (5.63 miles).....	11,661 07
Stockholders, residents of Ohio, 12.	
Amount of stock held by them June 30, 1881, \$100,000.	
Agents authorized to transfer stock: C. Werk, No. 12 Poplar street, Cincinnati, O.	

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....			Sept. 1, 1891	7.30	\$40,000 00	\$40,000 00
2d mortgage .....			Feb. 25, 1893..	7.30	23,000 00	23,000 00
Total.....					\$63,000 00	\$63,000 00

Average amount per mile of single main track (5.63 miles)..... \$11,190 05

## OTHER INDEBTEDNESS.

Total unfunded debt .....	\$32,768 02
Net unfunded debt.....	32,768 02
Average amount per mile of single main track.....	5,497 98
Total of paid in stock and debt.....	102,268 02
Total average amount per mile.....	17,159 00

## COST OF ROAD EQUIPMENT, ETC.

## CONSTRUCTION ACCOUNT.

The general expenditure was about \$132,500.

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 2 .....	\$12,000 00
First class passenger cars, 2.....	5,243 50
Platform cars, 22 .....	5,000 00
All other rolling stock, tools, machinery, etc.....	200 00
Total cost of railroad equipment owned by company .....	\$22,443 50
Total average amount per mile (of single main track, 5.63 miles) .....	4,201 92
Real estate, not included in the foregoing accounts.....	12,584 00

CHARACTERISTICS. ETC.

LINE IN OPERATION.

	Length.	In Ohio.
Total single main track, Cincinnati to Robb's Station.....	5.63 miles.	5.63 miles.
Aggregate of sidings and other tracks .....	.33 "	.33 "

Total length laid with rail computed as single track....	5.96 miles.	5.96 miles.
--	-------------	-------------

Length in Ohio, distributed as follows:

Hamilton county—main track, 5.63 miles; sidings, etc., .33 miles; total, 5.96 miles.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge, 3 feet.

Rail—Iron—Average weight per yard, 35 lbs.

**Ties**—Average number per mile: About 3,750.

laid during the year, 300.

Ballasted—On whole line, 5 miles.

In Ohio, 5 miles.

With broken stone.

## BRIDGES, TRETTLES, ETC., IN OHIO.

**Bridges**—Wood, 1; greatest age, 5 years; length, 40 feet.

Trestles—6; greatest age, 5 years; greatest height, 40 feet; greatest length, 500 feet; aggregate length, 1,900 feet.

Length of shortest span of truss, 12 feet; of longest, 20 feet; greatest length of beams between points of support, 20 ft.; all trestles are double<sup>s</sup> braced

Greatest space between cross ties upon bridges and trestles, 12 inches;  
length of ties, 6 feet.

Number of track stringers: In some cases one and in others two.

Are all bridges and trestles provided with guard rails? Yes.

FENCING—AVERAGE AND AGGREGATE COST.

All within the corporate limits of Cincinnati and Westwood.

## STATIONS.

STATIONS.

Passenger and freight .....	12; in Ohio, 12
-----------------------------	-----------------

### CROSSINGS.

Number of crossings of highways at grade in this State without protection, 3.

Number of crossings of highways at grade in this State at which there are gates or  
flagmen, 2.

## ROLLING STOCK.

Locomotives.....	2; Average weight, lbs.....	36,000
Passenger cars.....	2.	
Freight cars, all flat.....	22.	

Above includes not owned by company reporting.

Locomotives.....	2; Owned by Company.	
Passenger cars.....	2;	Cin. & Westwood R. R. Co.
Freight cars, all flat .....	5;	

Terms of service: \$5.00 per month for each flat car.

Number of locomotives equipped with train brakes, 2.

Kind of brake: Westinghouse air brake.

Number of cars equipped with train brakes, 2.

Kind: Westinghouse air brake.

Method of bridging between passenger cars, when two or more are run in trains:

The platforms touch each other pretty nearly.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: By coal stoves bolted to the floor.

Means of lighting same: By candles.

## SPEED OF TRAINS.

Mail and accommodation, average rate, including stops: 12 miles per hour.

## EMPLOYES.

Superintendents.....	1
Engineers.....	1
Flagmen, switch-tenders and watchmen .....	2
Firemen .....	1
Conductors.....	1
Section men.....	3

Total number employed by company in operating line..... 10

Proportion for Ohio..... 10

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average
Fare charged per mile—For distances less than 8 miles.....	.03c.	.02c.	.025c

## FREIGHT.

The price of freight is \$2.50 per car any where along the line of the road. It is so small an item that it is not worth mentioning.

DOINGS OF THE YEAR ENDING JUNE 30.

Train mileage—Passenger.....	61.93 per day.
Car mileage—Passenger.....	61.93 “
Fuel consumed—Coal, 704 tons ; total cost, \$1,957.89.	

EARNINGS, OPERATING EXPENSES, ETC., FOR THE YEAR ENDING JUNE 30.

EARNINGS.

Passenger transportation—local.....	\$9,025 61
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OPERATING EXPENSES.

Maintenance of way and structures .....	* \$1,264 23	
Motive power .....	† 2,388 22	
General expenses—Taxes in Ohio.....	824 07	
Other general expenses of operating .....	2,881 50	
Rentals paid for use of road, track, depots, equipment, etc..	2,231 73	
		\$9,589 75
Fuel .....		1,957 89
		—————
Total.....		\$11,547 64

Salaries—None paid.    Losing business.

State of Ohio, County of Hamilton, ss. :

F. W. Schwartz, President of the Cincinnati and Westwood Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

F. W. SCHWARTZ, *President.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 19th day of September, A. D. 1881.

N. MAUCHAUZ,  
*Justice of the Peace.*

[SEAL.]

\* This means it cost us so much to keep up the track.  
† Cost to run trains.

## CLEVELAND, COLUMBUS, CINCINNATI AND INDIANAPOLIS RAILWAY COMPANY.

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Name of road: Cleveland, Columbus, Cincinnati and Indianapolis Railway.

By whom owned: Cleveland, Columbus, Cincinnati and Indianapolis Railway Company.

By whom operated: Cleveland, Columbus, Cincinnati and Indianapolis Railway Company.

Name of person making this report: A. Ely, Auditor C. C. C. & I. Railway Company.

General office at Cleveland, Ohio.

Principal office in Ohio at Cleveland, Ohio.

Address correspondence relating to this report to A. Ely, Auditor, at Cleveland Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Cleveland, Columbus and Cincinnati Railroad Company was chartered March 12, 1845; was completed and trains run through from Cleveland, on Lake Erie, to Columbus, Ohio, February 22, 1851—138 miles. In the year 1861 the C. C. & C. R. R. Co. acquired, by purchase, that portion of the Springfield, Mt. Vernon & Pittsburgh Railroad between Delaware, Ohio, and Springfield, Ohio—50 miles. The Indianapolis, Pittsburgh & Cleveland Railroad, extending from the city of Indianapolis, Indiana, eastward to Union City, at the State line of Indiana—84 miles, and the Bellefontaine & Indiana Railroad, extending eastward from Union City to Galion, Ohio—119 miles, were consolidated under the name of the Bellefontaine Railway Company, in the year 1864, pursuant to the laws of the States of Ohio and Indiana. In April, 1868, the Cleveland, Columbus and Cincinnati Railroad Company was consolidated with the Bellefontaine Railway Company, under the name of the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company, pursuant to the laws of the States of Ohio and Indiana, making the total length of the C. C. C. & I. Railway 391 miles. On the 24th day of January, 1871, the C. C. C. & I. Railway Company, pursuant to the laws of the State of Ohio, became the lessees of the Cincinnati and Springfield Railway, extending from the city of Cincinnati, Ohio, northward to the city of Springfield, Ohio—80½ miles. Total length of the road owned and operated by the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company, 471½ miles.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. H. Devereux.....	President.....	Cleveland, O.....	
S. Burke.....	Vice President.....	".....	
Geo. H. Russell.....	Secretary.....	".....	
Geo. H. Russell.....	Treasurer.....	".....	
A. Ely.....	Auditor.....	".....	
E. B. Thomas.....	General Manager.....	".....	
O. B. Skinner.....	Traffic Manager.....	".....	
G. M. Beach.....	General Road Master.....	".....	
A. J. Smith.....	General Passenger Agent..	".....	
Lucien Hills.....	General Freight Agent.....	".....	
J. H. Devereux.....	Executive Committee }	".....	
S. Burke.....		".....	
T. P. Handy.....		".....	
Jas. Barnett.....		".....	
A. Townsend.....		".....	
Total salaries.....			\$41,300

## DIRECTORS.

Name.	Residence.	Name.	Residence.
J. H. Devereux.....	Cleveland...	Geo. H. Russell.....	Cleveland.
S. Burke.....	".....	B. S. Brown.....	Columbus.
Jas. Barnett.....	".....	H. J. Jewett .....	New York.
T. P. Handy.....	".....	Jas. R. Keene.....	".....
A. Townsend.....	".....	Walton Ferguson.....	".....
H. B. Hurlbutt.....	".....	H. P. Baltzer.....	".....
		A. G. Dulman.....	".....

## CAPITAL STOCK.

Capital stock authorized by law	{ Amount—common.....	\$15,000,000 00
	{ No. shares—common.....	150,000
	{ Par value of each—common	\$100
Capital stock authorized by vote of company—common.....		15,000,000 00
Amount subscribed—common.....		14,991,700 00
Total paid in capital stock—common.....		14,991,700 00
Average amount paid in per mile of single main track, 391.15 miles...		38,327 49
Proportion of same for Ohio, 306.6 miles.....		11,751,208 43
Capital stock issued, and on what account, as follows: All for construction and equipment.		
Stockholders, residents of Ohio.....		88
Amount of stock held by them June 30, 1881, 1338 shares.....		133,800 00
Agents authorized to transfer stock: United States Trust Co., N. Y.		
Number of shares transferred within the year at such agencies: Cleveland, 367; N. Y., 189,964; total, 190,331.		

## FUNDED DEBT.

1. Kind of bond or obligations.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually now out.
C., C., C. R. R. Co. b'ds.	June 1, 1860	\$25,000 each y'r	7	\$500,000	\$100,000
B.&T.R.R. 1st m't'ge b'ds	Jan'y 1, 1864	July, 1899.....	7	500,000	380,000
C., C., C. & I. Ry Co. S'kg f'd	May 1, 1869	May, 1899.....	7	3,000,000	3,000,000
C., C., C. & I. 1st consolidated bonds.....	June 1, 1874	June, 1914.....	7	7,500,000	2,959,000
Total.....				\$11,500,000	\$6,439,000

Average amount per mile of single main track, 391.15 miles.....	\$16,461 71
Proportion of same for Ohio, 306.60 miles.....	5,074,187 42
Increase since June 30, 1880 .....	133,000 00

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$812,863 13
Total unfunded debt.....	812,863 13
Cash securities, debit balances, etc., available to payment...	1,136,731 60
Surplus.....	\$323,868 47
Total net debt liabilities.....	6,115,131 53
Average amount per mile of single main track .....	\$15,633 72
Proportion of same for Ohio.....	4,793,298 55
Total of paid in stock and debt.....	21,106,931 53
Total average amount per mile.....	\$53,961 99
Proportion of same for Ohio.....	16,544,746 13

## COST OF ROAD EQUIPMENT, ETC.

## CONSTRUCTION ACCOUNT.

Expenditures prior to July 1st, 1880.....	\$18,093,121 97
Expenditures for the year ending June 30th, 1881.....	291,313 39
Total expenditures to July 1st, 1881.....	18,384,435 36
Total expenditures for construction and equipment.....	\$18,384,435 36

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cleveland to Columbus.....	138 miles.	138 miles.
“ Delaware to Springfield.....	50	50
“ Galion to Indianapolis.....	203.15	118.60
Total single main track.....	391.15	306.60



Double track, Cleveland to Berea.....	13.06	13.06
“ Crestline to Galion.....	5.08	5.08
“ Indianapolis to Brighton.....	119.69	92.81

Total length laid with rail computed as single track.....	530.87	417.55
Laid with steel rail.....	368.47	283.92
Length in Ohio distributed as follows :		

County.	Main track.	Double track.	Sidings, etc.	Total.
Cuyahoga.....	16.05	13.06	35.46	64.57
Lorain.....	27.73		7.20	34.93
Huron.....	14.74		1.95	16.69
Richland.....	15.78		4.45	20.23
Crawford.....	9.73	5.08	7.17	21.98
Morrow.....	24.72		1.71	26.43
Delaware.....	33.10		6.50	39.60
Franklin.....	11.73		3.78	15.51
Union.....	17.87		1.92	19.79
Champaign.....	10.61		1.50	12.11
Madison.....	.12			.12
Clark.....	11.04		3.57	14.61
Marion.....	31.30		3.71	35.01
Hardin.....	9.29		1.70	10.99
Logan.....	30.06		5.69	35.75
Shelby.....	23.05		3.00	26.05
Darke.....	19.68		3.50	23.18
Totals.....	306.60	18.14	92.81	417.55
Steel rail.....	390.62			

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 8½ in.
Grade—Maximum, per mile.....	53 feet.
Longest maximum.....	500 “
Curvature—Shortest radius .....	1,238 “
Aggregate length of all radii .....	161,568 “
Aggregate length of tangent.....	281.30 miles.
Rail—Iron—On road.....	26.93 “
Average weight per yard.....	60 lbs.
Steel—On road .....	390.62 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile .....	2,640
Number laid during the year.....	206,596
Ballasted—On whole line .....	391.15 miles
In Ohio .....	306.60 “
With broken stone, cinders and gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	13;	greatest age....	18 years;	aggregate length, ft..	2,088
Iron.....	29;	"	40	"	2,207
Stone arch	14;	"	...	"	1,469

Total..... 5,764

Trestles—Length of shortest span of truss, 31 ft.; of longest, 144 ft.; greatest length of beams between points of support, if not trussed, 15 ft

Greatest space between cross ties upon bridges and trestles, 12 inches; length of ties, 8 feet 6 in.

Number of track-stringers, 2.

Are all bridges and trestles provided with guard rails? No.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent person? Yes.

Kind of fencing, as follows:

Post and board (average cost per rod, \$1.10.)

Wire (average cost per rod, \$ .38.)

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

C., T. V. & W. Railroad at Grafton.

W. & L. E. Railroad at Wellington.

B. & O. Railroad at Shelby.

Northwestern Ohio Railroad at Vernon.

P., Ft. W. & C. Railroad at Crestline.

N. Y., Penn. & O. Railroad at Galion and Marion.

O. C. Railroad at Levering and Locust's.

C. & F. Railroad at Delaware and Marion.

C., C. & I. C. Railroad at Milford.

I., B. & W. Railroad at Springfield and Bellefontaine.

T., D. & B. Railroad at Versailles.

What railroads cross your road either over or under your grade in this State, and where?

D. & M. Railroad at Sidney.

N. Y., P. & O. Railroad at Cleveland.

Number of crossings of highways at grade in this State without protection, 238.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 20.

Number of crossings of highways over railroad, 5.

" " " under railroad, 5.

Number of highway bridges 18 feet above track, 5.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated, 391.15; in Ohio, 306.60.

Miles of same owned by railroad company: None.

## STATIONS.

Passenger and freight, 80; in Ohio, 61.

Number with telegraph communication, 65; in Ohio, 51.

Number of same operated by railroad company, 65; in Ohio, 51.

Is pay received for messages sent over line owned by railroad company? No.

## ROLLING STOCK.

Locomotives .....	146; average weight, lbs.....	60,000
Express and baggage cars .....	23; " " .....	29,000
Passenger cars .....	58; " " .....	36,000
Parlor and sleeping cars .....	11; " " .....	42,000
Freight cars .....	4,286; " " .....	16,000
Other cars .....	81; " " .....	21,000

Number of locomotives equipped with train brakes, 36.

Kind of brake: Westinghouse air brake.

Number of cars equipped with train brakes, 92.

Kind: Westinghouse air brake.

Number of passenger cars with Miller Platform, 92.

Method of bridging between passenger cars, when two or more are run in trains:

Miller platform and coupling.

Are all cars run on this road heated and lighted as prescribed by law? We think so.

State methods of heating cars used for the transportation of passengers: Winslow & Baker heaters and safety stoves.

Means of lighting same: 300 % oil.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	32 miles per hour.
Mail and accommodation, .....	25 "
Freight trains, .....	10 "

## EMPLOYES.

Superintendents .....	2
Telegraph operators .....	130
Engineers .....	178
Baggagemen.....	40
Flagmen, switch-tenders and watchmen .....	161
Laborers .....	428
Clerks .....	304
Train dispatchers.....	9
Firemen .....	184

Wipers.....	63
Mechanics .....	615
Conductors .....	93
Brakemen .....	249
Station agents .....	70
Section men.....	615
Other employes.....	227
Total number employed by company in operating line.....	3,368
Proportion for Ohio.....	2,640

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American and United States Express Co's.

Terms: About double first class freight rates.

Special freight and transportation lines:

White Line.

Hoosac Tunnel Line.

Empire Line.

Merchants' Despatch Transportation Co.

Great Western Despatch and South Shore Lines.

Terms as to rates (use of track, machinery, repair of cars), etc., with each:

White Line, Hoosac Tunnel, G. W. D., and South Shore Lines co-operate, being owned by the railroads in the lines. Merchants' Despatch Transportation Co. and Empire Line, about 9 % of business.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives .....	{ Passenger .....	12	Rails .....	{ Iron .....	5
	{ Freight .....	10		{ Steel .....	15
	{ Passenger .....	13	Joint fastenings .....		15
Cars .....	Baggage .....	13	Frogs .....		3
	Box .....	12	Ties—Oak .....		8
	Stock .....	12	Bridges .....	{ Wooden .....	10
	Coal .....	12		{ Iron .....	40
	Flat .....	12	Fence posts.....		15

## RATES OF TRANSPORTATION.

## PASSENGER.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles	10 Cts.	3 Cts.	3 Cts.
For distances over 8 miles—First class...	3	1	1.8
Second class	2	$\frac{3}{4}$	1
Emigrant ...	1	$\frac{1}{2}$	$\frac{3}{4}$
Excursion ...	2	$\frac{1}{2}$	$\frac{3}{4}$

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton: Rates are fixed by Ohio State law for 30 miles and under.

Rate per ton per mile on freight carried less than 30 miles: Rates for over 30 miles dependent on distance; no fixed basis.

Rate per 100 lbs. for loading or unloading: No charge made.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length—feet.
Columbus Division.....	Plate girder.....	Iron.....	53
Indianapolis Division.....	Truss.....	Iron.....	70
Indianapolis Division.....	Six-plate girder...	Iron.....	150

Fencing in Ohio—Miles of single fence rebuilt (average cost per rod, board, \$1.10; wire, 85c.), 30.93.

Ballasting—Miles of main track ballasted with broken stone, cinders and gravel, 41.60; in Ohio, 18.

Rail laid—Steel, 60 pounds per yard, miles of track, 48.58; in Ohio, 39.86.

Train mileage—Passenger .....	1,113,450	
Freight.....	2,501,533	
Construction.....	54,000	
Total.....		3,668,983
Car mileage—Passenger.....	3,653,435	
Express and baggage.....	1,801,619	
Freight—loaded .....	39,834,929	
empty .....	18,745,849	
Caboose.....	2,359,187	
Construction and other.....	459,815	
Total.....		66,854,834
Fuel consumed—Wood, 4,732 cords; coal, 132,344 tons; total cost.....		\$322,995 50
Losses, etc., paid—On goods and baggage.....		7,470 57
For injuries in Ohio, fatal and non-fatal—		
to passengers.....	\$906 00	
to employes.....	3,044 24	
to others.....	3,751 90	
Total.....		\$7,702 14

## For animals killed in Ohio—

25 horses.....	\$997 50	
4 mules.....	130 00	
72 cattle .....	1,129 00	
69 sheep.....	193 80	
72 hogs .....	253 10	
Total.....		\$2,703 40

## TRANSPORTATION.

Passengers—Number carried, local.....	766,121	
through.....	91,986	
Total.....		858,107
Average number carried in each car per trip.....		30
Average number of miles traveled by each.....		47
Total mileage, or number carried one mile.....		40,255,350
Average amount received for each .....		101 cents.
Average amount <i>per mile</i> received for each.....		2.143 "
Freight—Tons carried, local .....	945,802	
through .....	1,695,101	
Total.....		2,640,403
Average tons in each loaded car per trip.....		10
Average tons in each loaded car per mile.....		10
Total movement, or tons carried one mile.....		454,542,035
Average amount received for each ton.....		132 cents.
Average amount <i>per mile</i> received for each ton.....		.767 "
Average cost per ton freight per mile.....		.59 "
Average amount received for each ton through freight.....		131 "
Average amount received for each ton local freight.....		133 "

## Articles transported :

	Tons.	Per cent.
Coal.....	393,320	14.9
Stone, lime, sand, etc.....	135,390	5.1
Petroleum .....	69,049	2.7
Ores .....	19,697	.7
Pig and bloom iron .....	78,373	3.
Manufactured iron.....		
Lumber and other forest products.....	260,205	9.8
Grain, flour, and other agricultural products.....	774,940	29.4
Live stock.....	179,552	6.8
Animal products .....	71,588	2.7
Manufactures, including agricultural implements.....	116,143	4.4
Merchandise .....	542,146	20.5
Total tonnage yielding revenue. ....	2,640,403	100
Supplies for company's use .....	249,096	





Dividends, rate 5 per cent. on general stock, payable February 1, 1881.....	749,540 00	
Bonds of Company canceled (par value, \$67,000). ....	67,000 00	
Floating debt liquidated.....	421,000 00	
Construction of new work.....	291,313 39	}
Additional equipment.....		
Additional real estate.....		
Total.....		\$1,965,151 73

# CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$14,991,800 00	
C., C. & C. R. R., first mortgage bonds .....	100,000 00	
B. & I. R. R., first mortgage bonds.....	380,000 00	
C., C., C. & I. R'y, Sinking Fund bonds.....	3,000,000 00	
“ “ first consolidated bonds .....	2,959,000 00	
Bills payable.....	350,000 00	
Bills audited .....	441,675 85	
New York dividends unpaid.....	21,187 28	
Balance to surplus.....	1,531,189 67	
		\$23,772,752 80

## ASSETS.

Construction .....	\$18,384,435 36	
Materials on hand.....	210,550 18	
Cash in hands of Treasurer .....	225,930 02	
Due from R. R. Co's agents and others.....	910,801 58	
I. & St. L. R'y, stock and bonds, cost.....	976,750 00	
C. & S. R'y Co., bonds, cost.....	526,000 00	
“ advances to cost.....	1,667,291 77	
C., H. & D. R'y Co., stock, cost .....	671,186 09	
Dayton & Union Co., bonds and stock, cost .....	105,772 50	
Merchants Dispatch, stock, cost .....	25,000 00	
Columbus Union Depot Co., stock, cost .....	37,298 75	
Galion Stock Yard Co., stock, cost .....	2,557 50	
Real estate and wood-lands, cost.....	26,562 54	
Pendleton Stone Quarry, cost .....	4,616 51	
		\$23,774,752 80

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880.				
2	July 3	Wm. Hammon.....	Unknown.....	Supposed spell of fits.....	Scratched.
3	12	Jas. Arnold.....	None.....	Jumping on and off train.....	Legs mashed (died).
4	6	Unknown.....	Unknown.....	Willfully jumping off excursion train..	Face scratched.
5	Aug. 9	Jacob Icholtz.....	".....	".....	Seriously hurt.
6	16	Peter Farley.....	".....	Laying on track intoxicated.....	Killed.
7	21	Patrick Moran.....	".....	".....	"
8	July 31	J. D. Matzen.....	Brakeman.....	Laying on track asleep.....	Scalp torn loose.
9	Aug. 1	John Hern.....	Unknown.....	Seeking shelter under cars.....	Killed.
10	16	Watson Walsh.....	Brakeman.....	Coupling cars.....	Arm badly bruised.
11	29	John Kane.....	Engineer.....	Collision of trains.....	Killed.
12	29	Fred. Lowe.....	Fireman.....	".....	Collar bone broken.
13	29	Jno. Femucc.....	Brakeman.....	".....	Leg sprained.
14	31	Mike Allen.....	Unknown.....	Asleep on track.....	Killed.
15	Sept. 3	James Burne.....	Unknown.....	Trespassing on track.....	Left arm cut off.
16	2	E. Stump.....	Brakeman.....	Fell from top of train.....	Left leg broken.
17	6	Mrs. L. M. Middleton.....	".....	Attempting to pass over crossing in face of approaching train.....	Slight cut in head.
18	9	Master Shuller.....	".....	Stealing ride, and falling between cars	Killed.
19	15	Benj. Wright.....	Brakeman.....	Falling in descending from top of car..	Leg broken.
20	22	P. McCarty.....	Engineer.....	Running through open switch.....	Slightly bruised.
21	22	Mrs. Maggie Randall.....	".....	".....	Slightly shocked.
22	22	Isaac Angel.....	".....	".....	"
23	19	J. A. Burns.....	Brakeman.....	Fell from top of train to ground.....	Left arm broken.
24	Oct. 22	Martin Farrell.....	".....	Struck by a bridge.....	Badly bruised.
25	25	Chas. Brockom.....	Brakeman.....	Stealing a ride.....	Killed.
26	Nov. 20	H. Morden.....	Brakeman.....	Coupling.....	Crushed through chest.
27	Dec. 5	Barney Lyons.....	Tramp.....	Lying on track intoxicated.....	Killed.
28	1881.				
29	Jan'y 7	M. J. Degnon.....	Brakeman..	Struck by a projecting piece of timber on car while coupling.....	Quite badly hurt.
30	30	Michael McGee.....	".....	Carelessly stepping in front of a moving engine.....	Leg broken.
31	Feb'y 1	Jas. Maran.....	".....	Attempting to board a moving train..	Leg sprained.
32	4	L. F. Putt.....	".....	Derrailment of train.....	Seriously injured.

26	Feb'y	4	Lipman Joseph.....	Derailment of train.....	Slightly.
		4	Mrs. E. Windolph.....	"	"
		4	Lemuel McClolin.....	"	"
		4	Bridget Lyons.....	"	"
		4	David Williams.....	"	"
		4	Rob't Mullinger.....	"	"
27		17	Joseph Laubi.....	Lying on track intoxicated.....	Killed.
28	Mar.	13	David Kelly.....	Foot caught in rail while coupling.....	"
29	Feb'y	19	Mrs. W. W. Sylvester.....	Stepping off train.....	Ankle sprained.
30	Mar.	5	Thomas Gearity.....	Falling off between cars.....	Seriously injured.
31		13	James Farrell.....	Fell from top of car.....	Two cords of arm broken.
32		18	Daniel Fenneau.....	Knee and foot caught while descending ladder.....	Knee pan knocked out of place.
33		20	J. K. Myers.....	Standing on main track and being backed over by engine.....	Quite seriously, not fatally.
34		17	J. M. Hamon.....	Carelessness in coupling cars.....	Arm badly crushed.
35		22	Thos. Mains.....	Walking on track.....	Killed.
36	April	7	Thos. Woods.....	Carelessness in coupling cars.....	Arm squeezed.
37		16	John Jay.....	Stumbled while running over train.....	Ankle sprained.
38		15	P. Kane.....	Getting off train.....	"
39	May	4	H. A. McCoy.....	Dog slipped off of brake staff ratchet wheel.....	Arm broken.
40	April	26	H. Garber.....	Blowing out of cylinder head.....	Severely injured.
41	May	16	J. W. Adrian.....	Attempting to board a moving train.....	Shoulder dislocated.
42		20	Michael Mallaly.....	Attempting to climb through between trains.....	Leg cut off and hands bruised.
43		24	Thos. Kennally.....	Sitting on track.....	Killed.
		24	John Myers.....	"	Slightly injured.
44		31	Ed. Stillman.....	Sitting on track drunk.....	Killed.

## SUMMARY OF ACCIDENTS.

Persons killed—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....			1	1
Falling or thrown from engine or train.....			1	1
Collisions, and standing on platform of car during same....		1		1
Lying, walking, falling, or being on track.....		3	7	10
Explosion or capsizing of engines.....				
On hand cars, falling from or struck by engine.....		1		1
Totals.....		5	9	14

Persons injured—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....	1	3	3	7
Driving or riding across track.....			1	1
Struck by bridge, chute or other obstruction.....		2		2
Coupling, or caught between cars and engine.....		2		2
Falling or thrown from engine or train.....		5		5
Lying, walking, falling, or being on track.....		1	1	2
Collisions.....		2		2
Run over in yards, on siding or switching.....		2	1	3
Run over, catching foot in frog or between rails.....		1		1
Engine or train leaving or thrown from track.....	9	1		10
Broken axles and exploded or capsized engine.....		1		1
Breaking of brake rod, chain or wheel in setting.....		1		1
Miscellaneous.....		3	2	5
Totals.....	10	24	8	42

## RECAPITULATION.

Killed—Employees—from causes beyond their control.....	2
misconduct or want of caution.....	2
Others—stealing rides.....	3
trespassing, on track, etc.....	7
Total killed.....	14
Injured—Passengers—from causes beyond their control.....	10
misconduct or want of caution.....	1
Employees—from causes beyond their control.....	6
misconduct or want of caution.....	18
Others—at stations and highway crossings.....	2
stealing rides.....	3
trespassing, on track, etc.....	2
Total injured.....	42

## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	June 1	Levering .....	Pass' and frt.	Collision.....	One engine and some cars.
2	July 30	La Grange .....	Freight .....	Spring axle.....	Six cars off track.
3	Aug. 29	Cleveland .....	" .....	Carelessness on part of [employee.	Engine somewhat damaged; 1 man killed; 2 injured.
4	Sept. 15	Delaware .....	" .....	Cars jumping track.....	Trucks broken.
5	22	Springfield .....	Passenger.....	Misplaced switch.....	Engineer and two passengers slightly injured.
6	Oct. 22	Marysville .....	Freight .....	Broken rail.....	Ditched ten cars.
7	25	Davon .....	" .....	Collision.....	Caboose and some cars dam- aged.
8	Nov. 17	New London .....	" .....	" .....	Engine damaged.
9	Jan. 15	Berea .....	Passenger.....	" .....	Nothing serious.
10	Feb. 4	Harper .....	" .....	Derailment.....	Seven persons injured.
11	May 5	Bellefontaine .....	Freight .....	Vicious persons letting off brakes on some cars standing on side track...	
12	16	" .....	" .....	Collision .....	Cars damaged.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	1
Accidents not resulting in derailment of train.....	6
Collisions—butting .....	1
crossing .....	1
rear .....	3
<b>Total accidents.....</b>	<b>12</b>
Causes of accidents effecting derailment of trains:	
Broken rail.....	1
<b>Total.....</b>	<b>1</b>
Causes of collisions:	
Failure of brakes.....	1
Unexplained .....	1
Other causes.....	3
<b>Total .....</b>	<b>5</b>
Causes of accidents not resulting in derailment of trains:	
Broken axle .....	1
Malicious obstruction.....	1
Other causes.....	4
<b>Total .....</b>	<b>6</b>
<b>Total derailment.....</b>	<b>1</b>
<b>Total collisions.....</b>	<b>5</b>
<b>Total accidents .....</b>	<b>6</b>
	<b>12</b>

*State of Ohio, County of Cuyahoga, ss.:*

J. H. Devereux, President of the Cleveland, Columbus, Cincinnati & Indianapolis Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

J. H. DEVEREUX,  
*President.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 6th day of October, A.D. 1881.

[SEAL.]

J. T. WANN,  
*Notary Public.*

CLEVELAND AND MAHONING VALLEY RAILWAY COMPANY.

Name of road : Cleveland and Mahoning Valley Railway.  
By whom operated : New York, Pennsylvania and Ohio Railroad Company.  
By what authority : Lease.  
General office at Cleveland, Ohio.  
Principal office in Ohio at Cleveland.  
Address correspondence relating to this report to E. E. Poppleton, Secretary, at Cleveland, Ohio.

HISTORY OF ORGANIZATION AND CONSTRUCTION.

For history of the road would refer you to railroad report of 1875, pages 81 and 82.

A new lease was made the 4th day of May, 1880, to the New York, Pennsylvania and Ohio Railroad Company, which went into operation July 1, 1880. This lease takes the place of all previous leases.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
S. Burke .....	President.....	Cleveland, O.....	.....
J. H. Devereux.....	Vice President .....	" .....	.....
E. E. Poppleton .....	Secretary .....	" .....	.....
E. R. Perkins.....	Treasurer .....	" .....	.....
J. H. Devereux.....	} Executive Committee.	" .....	.....
W. B. Sanders.....		" .....	.....
Chas. Hickox.....		" .....	.....

DIRECTORS.

Name.	Residence.	Name.	Residence.
S. Burke .....	Cleveland, O.	Chas. Pease .....	Cleveland, O.
J. H. Devereux.....	"	W. B. Sanders.....	"
Joseph Perkins.....	"	E. B. Hale .....	"
John Tod .....	"	E. R. Perkins .....	"
Chas. Hickox.....	"		



## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$2,759,200 00
Par value of each—common .....	50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common.....	\$2,759,200 00
Amount subscribed—common .....	2,759,200 00
Total paid in capital stock—common.....	2,759,200 00
Average amount paid in per mile of single main track (123.35 miles) ...	\$22,368 87
Stockholders, residents of Ohio, 10.	
Amount of stock held by them June 30, 1881, \$950.00.	
Agents authorized to transfer stock: President and Secretary.	

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Am't actually issued.
1st mortgage .....		1873	1893	7%		\$740,500
2d " .....			1872	7%		100
3d " .....		1876	1896	7%		654,500
Hub. Br. mortgage.....			1873	7%		72,500
N. & N. L. mortgage .....		1870	1890			500,000
Total.....						\$1,967,600

## Only the first and third pay interest.

Average amount per mile of single main track .....	\$15,921 00
Amount in hands of Trustees of Sinking Fund for redemption .....	323,600 00
Total of paid in stock and debt.....	4,726,800 00
Total average amount per mile .....	38,320 00
Proportion of same for Ohio.....	All.

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

Right of way—Total expenditures to July 1, 1881.....	\$740 00
Total expended for construction and purchase.....	4,526,777 03
Average cost per mile of road constructed .....	36,198 58
Proportion of same for Ohio ...	All.

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length. In Ohio.	
Single main track, Cleveland to Youngstown .....	67	67
Youngstown to Sharon .....	14.50	3
Niles to New Lisbon .....	35.60	35.60
Vienna Junction to Vienna .....	7.75	7.75
Total single main track .....	124.85	123.35

## EARNINGS, OPERATING EXPENSES Etc., FOR YEAR ENDING JUNE 30TH.

## EARNINGS.

Leases for rent of road .....	\$357,180 00
Other sources .....	84,800 00
Total earnings of line operated included in this report.....	\$441,980 00

## OPERATING EXPENSES.

## General expenses:

Taxes in Ohio .....	\$177 52
Salaries .....	5,535 00
Other general expenses of operating .....	2,911 96

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds .....	\$80,986 50
Premiums and commissions for paying coupons .....	429 78
Dividends, rate 9½ per cent. on general stock .....	262,067 00
Last dividend declared on general stock, June 4, 1881.	
Additional real estate .....	15 00

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$2,759,200 00
Stock scrip .....	591 43
Funded debt .....	1,967,600 00
Unpaid coupons .....	2,781 15
Unpaid dividends .....	512 26
Profit and loss .....	284,493 24
Total .....	\$5,015,178 08

## ASSETS.

Construction .....	\$4,526,777 03
Capital stock, Pittsburgh & Lake Erie R. R .....	11,100 00
Scrip certificates.....	1,110 00
Prior lien bonds, N. Y., P. & O. R. R.....	80,000 00
Sinking fund .....	323,600 00
Personal account .....	600 00
Real estate .....	12,446 17
Unsettled accounts .....	13,127 55
Bonds extended.....	2,000 00
Cash.....	44,417 33
<hr/>	
Total.....	\$5,015,178 08

*State of Ohio, County of Cuyahoga, ss.:*

Stevenson Burke, President of the Cleveland and Mahoning Valley Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

STEVENSON BURKE,

*President.*

Subscribed and sworn to before me, this 27th day of August, A. D. 1881.

[SEAL.]

FRANK CANFIELD,

*Notary Public.*

## CLEVELAND AND MARIETTA RAILROAD COMPANY.

Name of road: Cleveland and Marietta Railroad.

By whom owned: Cleveland and Marietta Railroad Company.

By whom operated: Cleveland and Marietta Railroad Company.

By what authority: Charter.

Name of company making this report: Cleveland and Marietta Railroad Co.

General office at Cambridge, O.

Principal office in Ohio at Cambridge.

Address correspondence relating to this report to B. J. Gifford, President, at Cambridge, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

For organization and construction, see reports made from time to time by A. J. Warner, President and Receiver.

This road was sold by A. J. Warner, receiver, June 13, 1877, for \$200,000, to a party consisting of bondholders of the road, who appointed Cyrus W. Field, John Paton and Isaac Morton purchasing committee, to buy the same on their behalf.

On the first day of May, 1880, the road was transferred by deed to the Cleveland and Marietta R. R. Co., a corporation formed under the laws of the State of Ohio, and composed of certain bondholders of the M., P. & C. R. R. Co.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Isaac Morton.....	President .....	Cambridge, O.....	.....
S. C. Baldwin.....	Vice President.....	} Cleveland, O .....	.....
	Secretary .....		
I. Morton .....	Treasurer .....	Cambridge, O.....	.....
E. E. Kreuthoffer.....	Auditor .....	Marietta, O .....	.....
S. C. Baldwin .....	General Manager .....	Cleveland, O.....	.....
J. A. Kingsbury .....	Traffic Manager .....	} Marietta, O.....	.....
	General Superintendent...		
C. B. Childs .....	Chief Engineer.....	Akron, O .....	.....
J. A. Kingsbury .....	General Passenger Agent..	} Marietta, O.....	.....
	General Freight Agent.....		
	General Ticket Agent ...		
S. C. Baldwin .....	Executive Committee.....	{ Cleveland, O .....	.....
I. Morton .....		{ Cambridge, O.....	.....
Douglas Putnam .....		{ Marietta, O.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
I. Morton .....	Cambridge, O...	Larz Anderson .....	Cincinnati, O.
S. C. Baldwin .....	Cleveland, O...	C. W. West .....	"
John Paton .....	New York City..	F. H. Short .....	"
Chas. Lanier .....	" " ..	Douglas Putnam .....	"
Wm. M. Ramsey .....	Cincinnati, O ...	Cyrus W. Field .....	New York City.
A. J. Warner .....	Marietta, O.....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$4,000,000 00
Number of shares—common .....	80,000
Par value of each—common .....	\$50 00

## CAPITAL STOCK AUTHORIZED BY CHARTER OF COMPANY.

Amount—common (by vote, none) .....	\$4,000,000 00
Amount subscribed—common .....	1,218,000 00
Total paid in capital stock—common .....	1,218,000 00
Increase since June 30, 1880—common .....	1,218,000 00
Average amount paid in per mile of single main track (98.17 miles).....	12,407 00
Proportion of same for Ohio .....	All.
Capital stock issued, and on what account, as follows:	

On what account.	No. shares.	Amount of common.
For bonds of M. P. & C. R'y .....	24,360	\$1,218,000 00
Total .....	24,360	\$1,218,000 00

Stockholders, residents of Ohio, 30.

Agents authorized to transfer stock: Secretary of the company.

## OTHER INDEBTEDNESS.

Total unfunded debt .....	\$92,554 81	
Cash securities, debit balances, etc., available to payment..	25,162 60	
Net unfunded debt .....		\$67,392 21
Average amount per mile of single main track .....	\$673 92	
Proportion of same for Ohio .....	All.	
Increase since June 30, 1880 .....	9,489 28	
Total net debt liabilities .....		67,392 21
Average amount per mile of single main track .....	\$673 92	

## COST OF ROAD EQUIPMENT, ETC.

## ROAD ACQUIRED BY PURCHASE.

June 13, 1877.....	\$200,000 00
Subsequent expenditure for construction, since June 13, 1877 .....	96,069 08
Total expended for construction and purchase .....	296,069 08
Average cost per mile of road owned by company (single main track, 98.19 miles).....	3,015 27
Proportion of same for Ohio: All.	

## COST OF EQUIPMENT OWNED BY COMPANY.

9 locomotives, estimated.....	\$36,000 00
8 first-class passenger cars, estimated.....	14,000 00
11 box freight cars, " .....	5,500 00
12 platform cars, " .....	2,400 00
120 coal cars, " .....	24,000 00
1 mail and express car, estimated .....	1,200 00
26 section and hand cars, " .....	1,300 00
4 stock cars, estimated .....	1,400 00
2 caboose cars, " .....	1,000 00
8 dump cars, " .....	125 00
3 wrecking cars and bridge cars, estimated.....	600 00
All other rolling stock, tools, machinery, etc .....	5,975 00
Total cost of railroad equipment owned by company.....	93,500 00
Average amount per mile .....	9,060 59
Real estate not included in the foregoing accounts.....	8,230 06

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Marietta, O., to Canal Dover .....	98.19 miles.	All.
Total single main track.....	98.19 miles.	All.
Aggregate of sidings and other tracks.....	7.90 miles.	
Total length laid with rail computed as single track.....	106.09 miles.	
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Washington .....	26.45	2.60	29.05
Noble .....	21.07	1.16	22.23
Guernsey .....	27.87	1.74	29.61
Tuscarawas.....	22.80	2.40	25.20
Total .....	98.19	7.90	106.09

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio
Marietta City branch.....	1.26	All.
Total single track.....	1.26	All.
Total .....	1.26	All.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft. 8½ in.
Grade—Maximum, per mile on permanent line.....	50 feet.
Longest maximum on temporary line around in cut tunnel.....	132 "
Rail—Iron—Average weight per yard.....	50 lbs.
Ties—Number laid during the year.....	40,022

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—46; greatest age, 10 years; aggregate length, 3,039 feet.	
Trestles—244; greatest age, 10 years; greatest height, 41½ feet; greatest length 2,100; aggregate length, 28,274 feet.	
Length of shortest span of truss, 30 feet; of longest, 147 feet; greatest length of beams between points of support, if not trussed, 21 feet 4 in.	
Greatest space between cross ties upon bridges and trestles, 4 inches; length of ties, 8 feet and 6 inches.	
Number of track stringers, 4.	
Are all bridges and trestles provided with guard rails? Yes.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Constantly.	
Are the examinations analytical, and are they made by a competent person? Yes.	

Tunnels—Stone.....	1; aggregate length, ft.....	901
Wood .....	2; " .....	1870½
Total .....		2771½

Fencing—Average and aggregate cost.	Whole line.	In Ohio.
Number miles fencing, computed as single line (approximated).....	83	All.
Kind of fencing, as follows: Nearly all picket.	75cts.	.....
Average cost of same per rod. ....		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

B. & O. Railroad at Cambridge, Ohio.

P. C. & St. L. Railway at Newcomerstown, Ohio.



C. T. V. & W. Railway at Canal Dover, Ohio.

Number of crossings of highways at grade in this State without protection.....	91
“ “ “ “ at which there are gates or flagmen....	2
“ “ “ over railroad.....	3
“ highway bridges 18 feet above track.....	3
Do all trains stop at railroad crossings as required by law? Yes.	
Are flagmen stationed at each? Two.	

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated.....	98.19; in Ohio, All.
-------------------------------------	----------------------

### STATIONS.

Passenger and freight .....	27; in Ohio, All.
Number with telegraph communication .....	21; “
Number of same operated by railroad company .....	21; “
Is pay received for messages sent over line owned by railroad company? No.	

### ROLLING STOCK.

Locomotives .....	9; Average weight.....	55,000 lbs.
Express and baggage cars.....	2; “ .....	24,000 “
Passenger cars .....	8; “ .....	36,000 “
Freight cars .....	17; “ .....	18,000 “
Other cars .....	134; “ .....	14,000 “

Number of locomotives equipped with train brakes, 4.

Kind of brake: Westinghouse Air.

Number of cars equipped with train brakes, 7.

Kind: Westinghouse Air.

Method of bridging between passenger cars, when two or more are run in trains:

Portable Platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: A. P. Winslow safety car stove.

Means of lighting same: Candles and lamps.

### SPEED OF TRAINS.

Mail and accommodation .....	20 miles per hour.
Freight trains .....	12 “ “

### EMPLOYEES.

Superintendents.....	1
Telegraph operators.....	21
Engineers.....	9

Baggagemen .....	4
Flagmen, switch-tenders and watchmen .....	7
Clerks .....	7
Train dispatchers.....	1
Firemen.....	9
Wipers .....	6
Mechanics .....	20
Conductors.....	6
Brakemen .....	10
Station agents.....	27
Section men.....	70

Total number employed by company in operating line..... 198  
Proportion<sup>e</sup> for Ohio..... All.

#### EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams Express Co.

Terms: 1½ first-class rate, and 2.66 per day for messenger.

#### RATES OF TRANSPORTATION.

##### PASSENGERS.

	Highest.	Lowest
Fare charged per mile—For distances less than 8 miles.....	9.8c.	6.5c.
For distances over 8 miles—1st class.....	3c.	2c.
Excursion .....	2c.	2c.

##### FREIGHT.

Rate per ton per mile on freight carried less than 30 miles:		
First, second, third, fourth, fifth and special class.....	14.7c.	9.1c.
Rate per ton per mile on freight carried more than 30 miles:		
First, second, third, fourth, fifth and special class.....	8.1c.	2.6c.

#### DOINGS OF THE YEAR ENDING JUNE 30TH.

Fencing in Ohio—Miles of single fence built (average cost per rod, 75c.), about 13 miles.

Ballasting—Miles of main track ballasted with stone and coal, about 11 miles.

Rail laid—New iron, 317½ tons.

Train Mileage—Passenger ..	63,800
Freight .....	62,600
Mixed .....	62,600
Construction .....	13,250

Total..... 202,250

Car Mileage—Passenger .....	187,200	
Express and baggage .....	93,600	
Freight—loaded.....	577,500	
empty.....	288,900	
Caboose .....	76,430	
Total.....		1,223,630
Fuel consumed—Wood, 15 cords; coal, 7,119 tons. Total cost.....		\$7,845 90
Losses, etc., paid—On goods and baggage.....		227 97
For animals killed in Ohio: 1 horse .....	\$30 00	
7 cattle .....	116 50	
24 sheep.....	84 75	
Total.....		\$231 25

## TRANSPORTATION.

Passengers—Total number carried.....		83,432
Average number carried in each car per trip.....		24½
Average amount per mile received for each.....		2½c.
Freight—Total tons carried.....		152,085
Average tons in each loaded car per trip.....		10
Articles transported:		
	Tons.	Per cent.
Coal .....	65,834	43.3
Stone, lime, sand, etc.....	4,254	2.8
Petroleum .....	9,917	6.5
Ores .....	26,675	17.5
Pig and bloom iron.....	2,575	1.7
Manufactured iron.....	971	.7
Lumber and other forest products.....	8,136	5.4
Grain, flour, and other agricultural products.....	12,658	8.3
Live stock.....	5,022	3.3
Animal products .....	675	.4
Manufactures, including agricultural implements.....	3,537	2.3
Merchandise .....	10,275	6.8
Miscellaneous .....	1,556	1.0
Total tonnage yielding revenue .....	152,085	100
Supplies for company's use .....	1,164	

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local.....	\$38,378 15	
through.....	9,661 75	
Total.....		\$48,039 90

Freight transportation—Total.....	115,498 46
Mail service.....	4,870 72
Express service.....	3,834 00

Total earnings of line operated included in this report..... \$172,243 08

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$62,389 34	
Maintenance of cars.....	12,044 81	
Motive power .....	13,327 63	
Conducting transportation.....	44,757 39	
General expenses, as follows:		
Taxes in Ohio—All.....	\$2,012 35	
Salaries—Officers and general offices...	9,904 90	
Other general expenses of operating...	3,963 05	
	<hr/>	\$15,880 30
Total operating expenses, being 86.15 per cent. of earnings.....		\$148,399 47
		<hr/>
Net earnings of 98.19 miles operated .....		\$23,843 61
Rentals paid for use of road, track, depots, equipment, etc.:		
Car hire .....	\$2,437 86	
Depots, etc .....	466 52	
	<hr/>	\$2,904 38
		<hr/>
Net income over operating expenses and rents paid.....		\$20,939 23
Per mile of earnings.....		172 24
operating expenses.....		148 40
		<hr/>
Net earnings .....		\$23 84

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt.....	\$9,489 28
Sale of old material.....	10,838 12
Various sources.....	25,761 31
	<hr/>
	\$46,088 71

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Construction of new work.....	\$12,710 13
Additional equipment.....	9,060 59
Ballasting .....	6,141 64
Renewals of rail .....	15,917 33
Rebuilding bridges and trestles.....	25,308 52
	<hr/>
	\$69,138 21

## CONDENSED GENERAL BALANCE SHEET JULY 1, 1881.

## LIABILITIES.

Stock .....	\$1,218,000 00	
Pay-roll accounts .....	39,377 24	
Supply " .....	46,927 69	
Other R. R. accounts.....	6,249 88	
Total.....		\$1,310,554 81

## ASSETS.

Capital stock .....	\$1,218,000 00	
Cash .....	3,437 04	
Due from station agents and conductors .....	7,543 36	
Due from mail and express.....	1,516 62	
Materials and supplies .....	4,890 29	
Miscellaneous accounts .....	7,775 29	
Balance .....	67,392 21	
Total.....		\$1,310,554 81

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	Oct 16	Elij. Delong..	Farmer .....	Coach thrown off a trestle; cause unknown.....	Killed.
2	16	Wm. Martin.	" .....	Coach thrown off a trestle; cause unknown .....	"
3	Dec. 11	Roy Handall	Little boy.....	Walking on trestle, and was seen too late to stop train.....	"
4	Mar. 16	J. Fulkerson	Brakeman ...	Fell under cars while switching...	"
5	25	S. Haskins ...	" .....	Jumped from locomotive .....	Fracture of skull; recov'd.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Passengers—Engine or train leaving or thrown from track .....	2
Employes—Falling or thrown from engine or train .....	1
Others—Lying, walking, falling, or being on track .....	1
Total.....	4

## PERSONS INJURED—CAUSES.

Employes—Getting on or off engine or train in motion .....	1
--	---

## RECAPITULATION.

Killed—Passengers—misconduct or want of caution .....	2
Employees—““ .....	1
Others—trespassing on track, etc.....	1
Total killed.....	4
Injured—Employees—misconduct or want of caution.....	1

## TRAIN ACCIDENTS—ENTIRE LINE.

Oct. 16, 1880; near Newcomerstown; mixed train; caused by spreading of track; two passengers killed.

*State of Ohio, County of Guernsey, ss.:*

Benj. J. Gifford, President of the Cleveland and Marietta Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

BENJ. J. GIFFORD, *President.*

[SEAL OF R. R.]

Subscribed and sworn to before me this 18th day of November, A. D., 1881.

[SEAL.]

T. H. ANDERSON, *Notary Public.*

# CLEVELAND, MT. VERNON AND DELAWARE RAILROAD COMPANY AND G. A. JONES, RECEIVER, OPERATING.

Name of road: Cleveland, Mt. Vernon and Delaware Railroad.

By whom owned: Cleveland, Mt. Vernon and Delaware Railroad Company.

By whom operated: G. A. Jones.

By what authority: Order Summit County Common Pleas.

Name of receiver making this report: G. A. Jones.

General office at Mt. Vernon, Ohio.

Address correspondence relating to this report to E. Mize, Auditor, at Mt. Vernon, Ohio.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Thos. D. Messler.....	President .....	Pittsburgh, Pa .....	*\$2,400
G. A. Jones .....	Receiver.....	Mt. Vernon, O .....	3,000
J. L. Davis .....	Secretary .....	" " .....	500
J. D. Thompson .....	Treasurer.....	" .....	1,500
E. Mize .....	Auditor .....	.....	1,800
G. A. Jones .....	General Superintendent...	.....	†2,500
J. A. Tilton.....	General Freight and Gen'l Ticket Agent .....	.....	.....

\* No salary since appointment of Receiver.

† No salary as Superintendent since appointed Receiver.

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Thos. D. Messler .....	Pittsburgh, Pa.	M. White .....	Gambier, O.
Wm. Shaw.....	"	Wm. M. Orr.....	Orrville, O.
Geo. B. Roberts .....	Philadelphia.	Isaac Harpster .....	Millersburg.
Samuel Israel .....	"	D. W. Caldwell.....	Columbus, O.
Charles Cooper.....	"		



## ANNUAL REPORT.

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$5,000,000 00
preferred .....	500,000 00
Number of shares—common .....	100,000
preferred.....	10,000
	<hr/>
	110,000
Par value of each—common.....	50 00
preferred.....	50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common.....	\$5,000,000 00	
preferred.....	500,000 00	
	<hr/>	\$5,500,000 00
Amount subscribed—common.....	\$1,825,900 00	
preferred .....	451,450 00	
	<hr/>	2,277,350 00
Total paid in capital stock—common .....	\$1,318,430 45	
preferred.....	451,450 00	
	<hr/>	1,769,880.45
Increase since June 30, 1880—common.....		101 00
Average amount paid in per mile of single main track (144.04 miles)...		\$12,287 42
Capital stock issued, and on what account, as follows:		

On what account.	Number shares.	Amount of common.	Amount of preferred.
For subscriptions paid in cash.....	13,397	\$218,430 00	\$451,450 00
For purchase of lines.....	22,000	1,100,000 00	
	<hr/>		
Total .....	35,397	\$1,318,430 45	\$451,450 00

Stockholders, residents of Ohio, 572.

Amount of stock held by them June 30, 1881, \$147,518.00.

Agents authorized to transfer stock: J. S. Davis, Secretary, Mt. Vernon, O.

Number of shares transferred within the year at such agencies, 10.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....	Road & equip't..	Jan'y, 1870...	Jan'y, 1900.....	7	\$1,500,000 00	\$1,350,000 00
1st mortgage, Col. extension .....	Road & equip't..	Jan'y, 1872...	Jan'y, 1902.....	7	1,000,000 00	950,000 00
1st mortgage, past due coupons.....						1,121,741 91
2d mortgage, in- come.....		Jan'y 1, 1875	Jan'y, 1905.....	7		669,000 00
						<hr/>
Total.....						\$4,090,741 91

Average amount per mile of single main track (144.04 miles), \$28,400.04.

Increase since June 30, 1880, \$221,597.69.

### OTHER INDEBTEDNESS.

All other debts, current credit balances, etc .....	\$285 34
Cash securities, debit balances, etc., available to payment.....	285 34
Total net debt liabilities.....	\$4,090,741 91
Average amount per mile of single main track.....	28,400 04
Total of paid in stock and debt .....	5,860,622 36
Total average amount per mile .....	40,687 45

### COST OF ROAD EQUIPMENT, Etc.

Construction account.	Total expenditures to July 1, 1881.
Right of way.....	\$159,860 96
Civil engineering.....	44,448 96
Grading, masonry and bridges .....	1,426,563 03
Superstructure, iron rails, chairs and spikes.....	1,786,532 20
Engine and car houses.....	253,668 22
Telegraph .....	5,801 06
Interest and discount.....	261,767 18
Expended on Dresden Branch .....	222,205 22
Total expenditures for construction.....	\$4,160,846 83

Average cost per mile of road owned by Company (single main track 144.04 miles), exclusive of Dresden Branch, \$27,344.07.

### COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 16 .....	\$176,500 00
First class passenger, baggage and express cars, 26.....	89,500 00
Box freight and platform cars, 598 .....	394,250 00
All other rolling stock, tools, machinery, etc.....	26,700 00
Total cost of railroad equipment owned by company.....	\$686,950 00
Average amount per mile (of single main track, 144.04 miles).....	4,769 16
Total for road and equipment .....	4,847,796 83
Total average amount per mile (of single main track, 144.04 miles).....	32,113 23

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Killbuck via Warsaw to Dresden, 33 miles.

Length graded, not laid with rail: About three-fourths of; 17 miles.

State on what portion of the line: North.

Proposed gauge, 56½ inches.

## LINE IN OPERATION.

	Length.
Single main track, Hudson to Columbus .....	144.04
Total single main track .....	144.04
Aggregate of sidings and other tracks.....	22.75
Total length laid with rail computed as single track .....	166.79
Laid with steel rail .....	16.00

Length in Ohio, distributed as follows :

County.	Main track.	Branches.	Sidings, etc.	Total.
Summit .....	27.53	.....	4.96	32.49
Wayne .....	24.18	3.50	1.87	29.55
Holmes .....	29.12	.....	4.95	34.07
Knox .....	35.93	.....	5.76	41.69
Licking.....	.25	.....	.....	.25
Delaware.....	14.73	.....	.72	15.45
Franklin .....	12.30	.....	.99	13.29
Totals .....	144.04	3.50	19.25	166.79
Steel rail .....	16.00	.....	.....	.....

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.
Track of Central Ohio R. R.—Columbus .....	0.36

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 8½ inches.
Grade—Maximum, per mile .....	66 feet.
Longest maximum.....	7 miles.
Aggregate length of maximum.....	7 miles.
Curvature—Shortest radius .....	819 feet.
Aggregate length of shortest radius.....	2,700 "
Aggregate length of all radii .....	38.5 miles.
Aggregate length of tangent.....	106 "
Rail—Iron—On road.....	150.79 miles.
Average weight per yard.....	56 lbs.
Steel—On road.....	16 miles.
Average weight per yard .....	56 lbs.

Ties—Average number per mile.....	2,500
Number laid during the year.....	75,000
Ballasted—On whole line.....	144 miles.
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—26; greatest age, 10 years; aggregate length.....	3,130 ft.
Iron—1; greatest age, 9 years; aggregate length .....	313 "
Combination—1 stone and brick; aggregate length .....	40 "
Stone arch—Greatest age, 20 years; aggregate length.....	265 "
Total.....	3,748 ft.

Trestles—47; greatest age, 9 years; greatest height, 66 feet; greatest length, 1410 feet; aggregate length, 10,651 feet.

Length of shortest span of truss, 33 feet; of longest, 167 feet; greatest length of beams between points of supports, if not trussed, 12 feet.

Greatest space between cross ties upon bridges and trestles, 5 inches; length of ties, 12 feet.

Number of track-stringers, 2 on short springs, 4 on long girders.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Weekly.

Are the examinations analytical, and are they made by a competent person? Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line .....	340
Kind of fencing, as follows:	
Post and board (average cost per rod, \$1.00).....	268
Rail .....	70
Wire.....	2
Length of road unfenced .....	50

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

New York, Pennsylvania and Ohio Railroad at Akron.

Cleveland, Tuscarawas Valley and Wheeling Railway at Warwick.

Pittsburgh, Ft. Wayne and Chicago Railway at Orrville.

Baltimore and Ohio Railroad at Mt. Vernon.

Ohio Central Railroad at Centerburg.

What railroads cross your road either over or under your grade in this State, and where? Valley Railway at Akron.

Number of crossings of highways at grade in this State without protection.....	153
“ “ “ over railroad.....	149
“ “ “ under railroad.....	4
“ highway bridges 18 feet above track.....	4
Do all trains stop at railroad crossings as required by law? Yes.	
Are flagmen stationed at each? Yes.	

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated.....	145
-------------------------------------	-----

## STATIONS.

Passenger and freight.....	25
Number with telegraph communication.....	22
Number of same operated by railroad company.....	22
Is pay received for messages sent over line owned by railroad company? No.	

## ROLLING STOCK.

Locomotives, 18; average weight.....	60,000 lbs.
Express and baggage, 7; average weight.....	24,000 “
Passenger cars, 17; average weight.....	34,000 “
Freight cars, 600; average weight.....	18,000 “

Number of locomotives equipped with train brakes, 5.

Kind of brake: Westinghouse Air.

Number of cars equipped with train brakes, 15 coaches; 7 baggage cars.

Kind: Westinghouse Air.

Number of passenger cars with “Miller Platform,” none. With Janney Platform, 17.

Method of bridging between passenger cars, when two or more are run in trains:

Portable when there is no Janney Platform.

Are all cars run on this road heated and lighted as prescribed by law? As near as practicable.

State methods of heating cars used for the transportation of passengers: Most coaches heated by the “Spear” patent heater.

Means of lighting same: Candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation.....	25 “
Freight trains.....	12 “

## EMPLOYEES.

Superintendents and Receiver.....	1
Telegraph operators .....	6
Engineers.....	17
Baggagemen.....	6
Flagmen, switch-tenders and watchmen.....	8
Laborers .....	20
Clerks .....	10
Train dispatchers.....	1
Firemen .....	17
Wipers.....	8
Mechanics .....	37
Conductors.....	10
Brakemen .....	20
Station agents.....	26
Section men .....	170
Other employes .....	12

---

Total number employed by Company in operating line..... 369

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union Express.

Terms: Forty per cent. of the earnings.

Special freight and transportation lines: Union Line owned by Pennsylvania Company.

Terms as to rates (use of track, machinery, repair of cars), etc., with each: Usual rates for car mileage.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.
Fare charged per mile—For distances less than 8 miles .....	5c.	3c.
For distances over 8 mi.—1st class.....	3c.	3c.
Excursion .....	2c.	1c.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

	Highest.	Lowest.
First class .....	1½ Cts.	1½ Cts.
Second class.....	1½	1½
Third class.....	1½	1½
Fourth class.....	1.4	1¼
Fifth class.....	1	.75
Special class.....	1	.50

## Rate per ton per mile on freight carried less than 30 miles :

First class .....	1.50	1.00
Second class .....	1.50	1.00
Third class .....	1.50	1.00
Fourth class .....	1.40	1.00
Fifth class.....	1.00	.90
Special class .....	.80	.50

## Rate per ton per mile on freight carried more than 30 miles:

First class .....	5	3.50
Second class .....	4.3	1.60
Third class .....	4	1.60
Fourth class .....	3.6	1.50
Fifth class.....	2	.75
Special class .....	2	.75

## Rate per ton per mile for—

Coal—Carried ten miles or more.....	3.00	.70
Carried less than ten miles.....	.60	.50
Pig iron—Carried 10 miles or more .....	1.50	.70
Carried less than 10 miles .....	.80	.60
Limestone—Carried 10 miles or more .....	2.90	1.00
Carried less than 10 miles .....	.90	.50
Iron ore—Carried 10 miles or more.....	2.10	1.50
Carried less than 10 miles.....	.50	.50
Undressed stone or lumber—Carried 10 miles or more .....	2.90	1.75
Carried less than 10 miles.....	.90	.70

## DOINGS OF THE YEAR ENDING JUNE 30.

Rail laid—Steel, 56 lbs. per yard—miles of track.....	6.50	
Train mileage—Passenger.....	188,745	
Freight.....	194,150	
Construction.....	6,000	
Total.....		388,895
Car mileage—Passenger.....	627,576	
Express and baggage .....	289,771	
Freight—loaded .....	1,592,866	
empty .....	503,752	
Caboose.....	196,350	
Construction and other .....	8,240	
Total .....		3,218,555
Fuel consumed—Wood, 1,344 cords; coal, 14,140 tons. Total cost .....		\$26,090 75
Losses, etc., paid—On goods and baggage .....		225 00
For injuries in Ohio, fatal and non-fatal:		
To employes .....		777 59
For animals killed in Ohio:		
Twelve cattle.....		262 00





Freight transportation—local .....	\$125,317 01	
through.....	137,451 84	
Total.....		\$262,768 28
Mail service.....		11,679 28
Express service.....		10,658 07
Other sources.....		3,422 70
Total earnings of line operated included in this report.....		\$422,092 40

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$142,790 83	
Maintenance of cars .....	26,013 93	
Motive power .....	88,614 98	
Conducting transportation .....	72,309 78	
General expenses, as follows:		
Taxes in Ohio .....	\$10,675 33	
Salaries .....	9,725 00	
Other general expenses of operating .....	5,877 12	
		\$26,277 45
Total operating expenses, being 84.343 % of earnings.....		\$356,006 92
Net earnings of 145 miles operated.....		66,085 48
Rentals paid for use of road, track, depots, equipment, etc.:		
Equipment.....	\$4,867 24	
Use of M. & C. R. R. track .....	3,929 86	
		8,797 10
		\$57,288 38
Per mile of earnings.....		\$2,923 10
operating expenses .....		2,465 40
net earnings.....		457 70

CLEVELAND, MT. VERNON &amp; DELAWARE R. R., G. A. JONES, RECEIVER.

Balance sheet July 1, 1881.

## LIABILITIES.

Due for current expenses.....	\$35,736 11	
Bills payable.....	28,767 36	
Due other companies.....	6,806 89	
Miscellaneous .....	1,332 76	
Profit and loss .....	38,943 90	
		\$111,587 02

## ASSETS.

Due by other companies.....	\$6,333 81
Due by station agents .....	13,607 08
Due by Union Express Co.....	1,203 90

Due by U. S. P. O. Department.....	2,905 91	
Cash in hands of Treasurer.....	14,147 28	
New equipment.....	40,918 49	
Expended on Fo. & Lake branch.....	18,116 75	
Miscellaneous.....	14,353 80	
		\$111,587 02

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Common stock .....	\$1,318,430 45	
Preferred stock .....	451,450 00	
First mortgage bonds .....	1,350,000 00	
First mortgage bonds, Columbus extension .....	950,000 00	
First mortgage coupons and interest on same.....	1,121,741 91	
Income bonds.....	669,000 00	
Miscellaneous .....	285 34	
		\$5,860,907 70

## ASSETS.

Cost of road and equipment.....	\$4,629,298 44	
Expended in Dresden bank .....	222,205 22	
Bills receivable .....	5,426 25	
R. C. Hind's estate.....	7,274 22	
Miscellaneous .....	1,792 47	
Profit and loss .....	994,911 10	
		\$5,860,907 70

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1880.				
Sept. 24	Patrick Reagan..	Co. employe.	Walking on track, intoxicated; usual signal-given unheeded.....	Killed.
Oct. 1	— Davin, rt...	Citizen, occupation unknown.	Walking on track intoxicated.....	Shoulder dislocated.
1881.				
Jan. 26	L. Gurnes.....	Conductor...	Express train thrown from track, caused by broken rail.....	Injured in neck.
26	— Ebright .....	Druggist .....	Same cause.....	Broken arm.
26	— Firestone .....	Physician .....	" .....	Broken l-g.
26	2 or 3 others .....	" .....	" .....	Slightly injured.
Feb. 2	P. Hilduff.....	Co. employe.	Working on track; str'k by engine; want of caution .....	Foot crushed.
June 2	F. Wilson.....	Engineer .....	Bridge broke down.....	Seriously injured, not fatally.
2	S. Martin .....	Fireman .....	" .....	Killed.

*State of Ohio, County of Knox, ss.:*

G. A. Jones, Receiver of the Cleveland, Mt. Vernon and Delaware Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

G. A. JONES,

[SEAL OF R. R.]

*Receiver Cleveland, Mt. Vernon & Delaware R. R. Co.*

Subscribed and sworn to before me this 23d day of September, A. D. 1881.

[SEAL.]

JOS. S. DAVIS,

*Notary Public in and for Knox county, O.*

## CLEVELAND AND PITTSBURGH RAILROAD COMPANY.

Name of road: Cleveland and Pittsburgh Railroad.  
 By whom operated: Pennsylvania Company.  
 Name of person making this report: Geo. A. Ingersoll, Treasurer Cleveland and Pittsburgh Railroad Company.  
 General office at Cleveland, O.  
 Principal office in Ohio at Cleveland, O.  
 Address correspondence relating to this report to Geo. A. Ingersoll, Secretary and Treasurer, Cleveland, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Date of construction.	Miles
1851, Cleveland to Ravenna.....	38
1852, Ravenna to Hanover.....	38
1853, Hanover to Wellsville.....	25
1853, Bayard to Oneida .....	6
1854, Oneida to New Philadelphia.....	25
1856, Wellsville to Rochester.....	23
1856, Yellow Creek to Bellaire .....	43
Total .....	198

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. N. McCullough.....	President .....	Pittsburgh, Pa.....	\$5,000
Geo. A. Ingersoll .....	Secretary and Treasurer ...	Cleveland, O.....	1,000

### DIRECTORS.

Name.	Residence.	Name.	Residence.
J. N. McCullough.....	Pittsburgh, Pa.	Chas. Lanier .....	New York.
B. F. Jones.....	"	Frances T. Walker.....	"
Geo. B. Roberts .....	Phila., Pa.	E. A. Fergusson .....	Cincinnati, O.
Wm. Bucknell.....	"	J. V. Painter.....	Cleveland, O.
Frederick Sturges .....	New York	Jas. F. Clark .....	"
S. J. Tilden.....	"	R. P. Ranney.....	"



## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

From lessee in accordance with terms of lease ..... \$1,223,116 52

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds .....	\$344,780 00
Dividends, rate 7 and 10 per cent. on general stock .....	786,891 48
Last dividend declared on general stock: June 1, 1881.	
Bonds of company canceled (par value, \$1,000).....	13,000 00
General expenses of organization.....	9,530 35
Expenditure in closing up business prior to lease .....	715 51

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Capital stock.....	\$11,233,400 00
Scrip issues .....	10,936 31
	<hr/> \$11,244,336 31
Second mortgage bonds.....	500 00
Third mortgage bonds.....	5,000 00
Fourth mortgage bonds.....	\$1,096,000 00
Fourth mortgage scrip.....	8,843 63
	<hr/> 1,104,843 63
Mortgage bonds of 1900.....	\$2,840,500 00
Less Sinking Fund .....	279,500 00
	<hr/> 2,561,000 00
Construction and equipment bonds.....	\$1,567,000 00
Less Sinking Fund.....	94,000 00
	<hr/> 1,473,000 00
Balance, old income account .....	8,249 94
Guaranteed income account, balance under lease.....	539,393 61
Due and unpaid on dividends and coupons.....	115,978 15
Due to R. R. and individuals.....	147,699 35
Real estate.....	4,260 40
	<hr/> \$17,204,261 39

## ASSETS.

Construction account.....	\$12,755,514 99
Equipment.....	3,375,744 31
Machinery and tools.....	102,024 14
Personal property .....	50,112 97
Telegraph line .....	23,270 48
Cash in hands of Treasurer and at New York agency.....	328,087 03
Stock and bonds of R. R. Co.....	82,500 00



Due from R. R. and individuals.....	222,866 99
Material account Pennsylvania R. R. Co., lessee.....	261,210 66
Betterment account Pennsylvania R. R. Co , lessee.....	- 2,929 82
	<hr/> \$17,204,261 39

*State of Ohio, county of Cuyahoga, ss. :*

G. A. Ingersoll, Secretary and Treasurer of the Cleveland and Pittsburgh Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

G. A. INGERSOLL,

*Secretary and Treasurer.*

Subscribed and sworn to before me, this 27th day of August, A. D. 1881.

L. P. CARR,

*Notary Public.*

[SEAL.]

PENNSYLVANIA COMPANY OPERATING CLEVELAND AND  
PITTSBURGH RAILROAD.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
G. B. Roberts.....	President .....	Philadelphia, Pa.....	
J. N. McCullough .....	1st Vice President .....	Pittsburgh.....	
Wm. Thaw .....	2d " .....	" .....	
Thos. D. Messler.....	3d Vice Pres. and Compt'r .....	" .....	
S. B. Liggett.....	Secretary .....	" .....	
W. H. Barnes .....	Treasurer .....	" .....	
Jas. Instan .....	Auditor .....	Cleveland, O.....	
D. W. Caldwell.....	General Manager .....	Pittsburgh, Pa .....	
R. F. Smith .....	Asst. General Manager .....	Cleveland, O .....	
John Thomas .....	Superintendent .....	" .....	
F. Slataper .....	Chief Engineer.....	Pittsburgh, Pa .....	
E. A. Ford .....	Gen. Passenger & Freight Agt .....	" .....	
Wm. Stewart.....	General Freight Agent .....	" .....	
J. N. McCullough.....	Executive Committee {	" .....	
Wm. Thaw .....		" .....	
Thos D. Messler .....		" .....	
W. H. Barnes .....		" .....	
Jno. P. Green .....		" .....	

DIRECTORS.

Name.	Residence.	Name.	Residence.
G. B. Roberts .....	Philadelphia .....	Jno. P. Green.....	Philadelphia.
Wistar Morris.....	" .....	H. H. Houston .....	" .....
S. M. Felton.....	" .....	J. N. McCullough.....	Pittsburgh.
Henry M. Phillips.....	" .....	Wm. Thaw .....	" .....
J. P. Wetherell.....	" .....	Thos. D. Messler.....	" .....
A. J. Cassatt .....	" .....	W. H. Barnes .....	" .....
J. N. DuBarry.....	" .....		

CHARACTERISTICS, ETC.

LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cleveland, O., to Yellow Creek, O.....	97.67 miles.	97.67 miles.
Bellaire, O., to Rochester, Pa .....	68.97 "	54.04 "
Bayard, O., to New Philadelphia, O.....	31.02 "	31.02 "
Total single main track.....	197.66 miles.	182.73 miles.

Double track, Cleveland to Cleveland Mach. shops.. 1.42  
 Yellow Creek to Wellsville " .. 2.10

Aggregate of sidings and other tracks..... 62.97 " 54.01 "

Total length laid with rail computed as single track... 264.15 miles. 240.26 miles.  
 Laid with steel rail..... 138.45 " 123.52 "  
 Length in Ohio, distributed as follows :

County.	Main track.	Double track.	Sidings, etc.	Total.
Cuyahoga.....	16.53	1.42	21.61	39.56
Summit.....	12.06		2.10	14.16
Portage.....	22.04		4.69	26.73
Mahoning.....	.90			.90
Stark.....	9.93		2.88	12.81
Columbiana.....	44.87	1.64	12.68	59.19
Carroll.....	11.49		.58	12.07
Tuscarawas.....	15.08		1.84	16.92
Jefferson.....	39.38	.46	4.85	44.69
Belmont.....	10.45		2.78	13.23
Total.....	182.73	3.52	54.01	240.26
Steel rail.....	123.52			

#### LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Cleveland and Pittsburgh Railway.....	197.66 miles.	182.73 miles.
P., Ft. W. and C. Railway, joint use of.....	25.64 "	
Total single track.....	223.30 miles.	182.73 miles.
Double track.....	3.52 "	3.52 "
Sidings and other tracks.....	62.97 "	54.01 "
Total.....	289.79 miles.	240.26 miles

#### GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4 feet 9 in.
Grade—Maximum, per mile.....	50 feet.
Longest maximum.....	24,900 "
Aggregate length of maximi.....	24,900 "
Curvature—Shortest radii.....	1,206 "
Aggregate length of shortest radius.....	31,300 "
Aggregate length of all radii.....	271,972 "
Aggregate length of tangent.....	131.22 miles.

Rail—Iron—On road .....	116.19 miles.
Average weight per yard .....	60 lbs.
Steel—On road .....	138.45 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile .....	3,000
Number laid during the year .....	84,120
Ballasted—On whole line .....	197.66 miles.
In Ohio .....	182.73   “
With slag, cinders, stone and gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood,	55;	greatest age, 13 years;	aggregate length..	3,918 feet.
Iron,	22;	“      14      “      “	..	1,525   “
Stone arch,	37;	“      30      “      “	..	2,689   “
Total .....				8,132   “

Trestles—5; greatest age, 10 years; greatest height, 30 ft.; greatest length, 409 feet; aggregate length, 772 feet.

Length of shortest span of truss, 17 feet; of longest, 160.

Greatest space between cross ties upon bridges and trestles, 24 inches; length of ties, 8 feet 9 inches.

Number of track stringers, 2.

Are all bridges and trestles provided with guard rails? Nearly all.

Do all bridges and trestles receive stated examinations? Yes.

How often? From one to four times per month.

Are the examinations analytical, and are they made by a competent person? Yes.

Tunnels, brick 1; length, 1,010 feet.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio
Number miles fencing, computed as single line .....	308	278
Length of road unfenced, and the reason therefor .....	.....	70
Through towns not requiring fencing.		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

N. Y., P. & O. (Mahoning Division) Railroad, at 1 mile west of Newburgh.

N. Y., P. & O. (Main Line) Railroad at 3½ miles west of Ravenna.

Connotton Valley Railroad at Minerva and Oneida.

P., Ft. W. & C. Railway at Alliance.

T., V. & W. Railroad at Bridgeport.

L. S. & M. S., and C., C., C. & I. Railroad at Cleveland yard.

What railroads cross your road either over or under your grade in this State, and where?

Connotton Valley Railroad at 4 miles east of Hudson.

P., C. & St. L. Railroad at 1 mile east of Steubenville.

Number of crossings of highways at grade in this State without protection, 286.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 9.

Number of crossings of highways over railroad, 3.

“ “ under railroad, 17.

Number of highway bridges 18 feet above track, 2.

Number of highway bridges less than 18 feet above track, none.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated ..... 277; in Ohio, 181

Miles of same owned by railroad company, jointly with W. U. Tel.

Company ..... 277; “ 181

### STATIONS.

Passenger and freight ..... 60; in Ohio, 46

Number with telegraph communication ..... 43; “ 31

Number of same operated by railroad company ..... 5; “ 4

Is pay received for messages sent over line owned by railroad company? No.

## ROLLING STOCK.

Locomotives.....	97;	Average weight, lbs .....	60,000
Express and baggage cars.....	22;	“ “ .....	28,000
Passenger cars.....	43;	“ “ .....	32,000
Parlor and sleeping cars.....	4;	“ “ .....	..
Caboose.....	46;	“ “ .....	18,000
Freight cars.....	3,220;	“ “ .....	16,000
Other cars.....	84;	“ “ .....	20,000

Above includes not owned by company reporting.

Parlor and sleeping cars 4; owned by Pullman Palace Car Company.

Number of locomotives equipped with train brakes, 20.

Kind of brake: Westinghouse air brake.

Number of cars equipped with train brakes, 62.

Kind: Westinghouse air brake.

Number of passenger cars with “Miller Platform,” none.

Method of bridging between passenger cars, when two or more are run in trains:

By use of compression buffers and raised platform on level with car floor, and running close together, and used in connection with Janney's coupling.

State methods of heating cars used for the transportation of passengers: 28 cars with Bissel & Co. safety heaters; 1 car with Winslow safety heaters; 4 cars with Jas. Spear safety heaters; 2 cars with Dipps safety heaters; all other cars heated by bituminous coal stoves.

Means of lighting same: Candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	28 miles per hour.
Mail and accommodation, " .....	20 "
Freight trains, " .....	10 "

## EMPLOYEES.

Superintendents .....	1
Telegraph operators.....	69
Engineers .....	86
Baggagemen .....	20
Flagmen, switch-tenders and watchmen.....	80
Laborers .....	200
Clerks .....	90
Train dispatchers.....	17
Firemen .....	85
Wipers .....	42
Mechanics .....	295
Conductors.....	75
Brakemen .....	130
Station agents .....	56
Section men.....	420
Other employes .....	46

Total number employed by company in operating line.....	1,712
Proportion for Ohio.....	1,562

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams Express Company, and Union Express Company.

Terms: \$40,000 per annum. Accommodations on regular passenger trains furnished.

Special freight and transportation lines: Union line, owned and operated by Pa.Co.

Terms as to rates (use of track, machinery, repair of cars,) etc., with each: Transacts its business at current rates, paying all expenses of obtaining freight, and keeping accounts of forwarding and delivery thereof, for which they receive a commission of 5 per cent. on east bound, and 10 per cent. on west bound freight, carried in their own cars, for which they receive customary mileage.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives	Passenger .....	14	Frogs .....		4
	Freight .....	14	Ties	Oak .....	7
	Passenger .....	11		Cedar .....	7
	Baggage .....	11	Bridges	Wooden .....	12
Cars	Box .....	10		Iron .....	20
	Stock .....	10		Trestles .....	10
	Coal .....	10		Piling .....	10
	Flat .....	10	Telegraph poles	Cedar .....	10
Rails	Iron .....	5		Other .....	5½
	Steel .....	10	Fence posts .....		10
Joint fastenings .....		15			

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile:	Highest.	Lowest.	Average.
For distances less than 8 miles .....	.....Cts.	3.32 Cts.	} 2.6 cts. per mi. for all cls's for yr
over 8 miles—First class.....	3.75	2.77	
emigrant.....	1	.75	
Amount charged in addition to regular fares, in sleeping or other cars run on your road: For seat, 75 cents; berth, \$1.50			

## FREIGHT.

Rate per 100 lbs. per mile when freight weighs less than a ton :			
First class.....	1	.25	} For all classes for yr. .60 cts. per 100lbs per mile.
Second class.....	.75	.20	
Third class.....	.63	.15	
Fourth class.....	.50	.13	
Fifth class.....	.38	.10	
Rate per ton per mile on freight carried less than 30 miles :			
First class.....	.20	8.40	} 1.21cts.per ton per mile.
Second class.....	.15	6.80	
Third class.....	12.60	6.20	
Fourth class.....	10	5.40	
Fifth class.....	7.50	4.60	
Rate per ton per mile on freight carried more than 30 miles :			
First class.....	7.60	5	} 1.21 cts.per ton per mile.
Second class.....	6.40	4	
Third class.....	5.60	3	
Fourth class.....	4.40	2.50	
Fifth class.....	3.80	2	



## Rate per ton per mile for—

Coal—Carried ten miles or more.....	4	1
carried less than ten miles.....	10	5
Pig iron—Carried ten miles or more.....	7.50	1.33
carried less than ten miles.....	7.50	4.60
Limestone—Carried ten miles or more.....	5	1.65
carried less than ten miles.....	5	5
Iron ore—Carried ten miles or more.....	5	.90
carried less than ten miles.....	10	5
Undressed stone or lumber—Carried ten miles or more.....	3.80	2
Undressed stone or lumber—Carried less than ten miles.....	7.50	4.60

No charge made for loading or unloading.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges rebuilt in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length—feet.
No. 11 $\frac{1}{2}$ , $\frac{1}{10}$ mile west Earlville ...	Iron girder .....	Iron .....	29
22, $\frac{1}{10}$ " " Moultrie...	" .....	" .....	55
27, $\frac{1}{10}$ " " east Bayard ..	" .....	" .....	65
30, $\frac{2}{10}$ " " Millport...	" .....	" .....	54 ft. 3 in.
35, $\frac{1}{10}$ " " west Salineville ..	" .....	" .....	55 ft. 5 in.
139, $\frac{1}{10}$ " " Magnolia...	Howe truss .....	Wood .....	28

Trestles built in Ohio, 1; length, 146 feet.

Length filled and converted into embankment, 118 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod \$1.04), 6.

Ballasting—Miles of main track ballasted, 21.33; in Ohio, 17.10.

Rail laid—Steel, 60 lbs. per yard—miles of track, 18.23; in Ohio, 17.21.

Train mileage—Passenger..... 547,333

    Freight and mixed ..... 1,746,426 |    Construction ..... 69,324 |

Total ..... 2,363,083

Car mileage—Passenger..... 1,252,908

Express and baggage..... 757,490

    Freight—loaded ..... 16,678,053 |    Freight—empty ..... 5,851,158 |    Caboose ..... 1,144,998 |

Construction and other..... 703,842

Total..... 26,388,449

Fuel consumed—Wood, 5,761 cords; coal, 59,538 tons. Total cost..... \$89,706 27

Losses, etc., paid—On goods and baggage ..... 1,108 72



Manufactures, including agricultural implements ...	197,153	8.98
Merchandise .....	68,738	3.13
Miscellaneous .....	47,795	2.18

Total tonnage yielding revenue .....	2,195,390	100.
Supplies for company's use.....	77,874	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local .....	\$369,825	28
through .....	108,564	37

Total .....	\$478,389 65
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Freight transportation—local.....	\$1,322,812	47
through .....	1,020,729	56

Total.....	2,343,542 03
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Mail service.....	27,875 11
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Express service .....	39,999 96
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Other sources .....	304,660	15
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Total earnings of line operated included in this report.....\$3,194,466 90

OPERATING EXPENSES.

Maintenance of way and structures.....	\$324,213	36
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Maintenance of cars .....	174,879 08
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Motive power .....	397,880 91
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Conducting transportation .....	482,574 27
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General expenses:

Taxes in Ohio.....	68,351 43
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Pennsylvania .....	3.826 85
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Salaries .....	5,733 97
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Other general expenses of operating.....	31,551 59
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Total operating expenses, being 46.61 per cent of earnings.....\$1,489,011 46

Net earnings of 223.30 miles operated.....	1,705,455 44
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## Rentals paid :

C. & P. R. R. payments under lease.....	\$1,223,116	52
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P. H. W. & C. R'y, joint use of track.....	85,000 00
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"	"	interest on improvements .....	17.782 46
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Total .....	1,325,898 98
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Net income over operating expenses and rents paid .....	379,556 46
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Per mile of earnings, \$14,305.71; proportion for Ohio (182.73 miles).....	2.614,082	39
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"	operating expenses, \$6,668.21; proportion for Ohio.....	1,218.482 01
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net earnings, \$7,637.50; proportion for Ohio .....	1,395,600 38
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## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
<b>Fatal, 1880.</b>				
Sept. 13	Patrick Geturus.....	Other .....	Lying on track drunk.....	
14	Frank Shoskey .....	" .....	Stealing ride .....	
25	Jonah Jones.....	" .....	Lying on track drunk.....	
<b>Nov. 5</b>	Wm. Cullum .....	Passenger .....	Jumping from train.....	
6	Robt. Moore.....	Other .....	Getting on moving train .....	
20	John Lany.....	" .....	Crossing track .....	
29	Jos. P. McGraw.....	Brakeman .....	Caught between cars.....	
<b>Dec. 4</b>	Wm. Steen .....	Other .....	Found dead on track .....	
8	Alfred Baron .....	" .....	Crossing track .....	
20	Frances Barton.....	" .....	" .....	
<b>1881.</b>				
Feb'y 18	Frank Kibler .....	Brakeman .....	Fell from train .....	
March 5	E. P. Bell .....	" .....	Foot caught between rails.....	
May 7	Wm. Otteron .....	Engineer.....	Train thrown from track .....	
15	J. B. Buffington .....	Brakeman .....	Foot caught in frog .....	
19	Isaac McLain.....	Other .....	Crossing track .....	
25	Wm. Fenteburgh .....	" .....	" .....	
26	A. J. McQuilkin.....	Brakeman .....	Knocked from car by bridge.....	
<b>Non-fatal, 1880.</b>				
July 3	Robt. J. Dennis .....	Other .....	Sitting on track .....	Severely hurt.
Augst 14	O. P. Apple .....	Brakeman .....	Collision .....	Leg broken.
21	A. Henicke .....	Other .....	Lying on track drunk .....	Head cut and arm crushed.
14	Mike Keough.....	" .....	Stealing ride .....	Broken leg.
27	James Brown.....	" .....	Crossing track with wagon .....	Cut and bruised.
7	Z. Dales .....	Brakeman .....	Getting off train.....	Broken leg.
24	D. Quagle .....	" .....	Coupling cars.....	Fingers mashed.
<b>Oct. 8</b>	John Reynolds .....	Other .....	Stealing ride; fell from train.....	Badly hurt.
9	B. F. Exline.....	Brakeman .....	Caught between cars—coupling .....	Severely hurt.
21	A. W. Pedlar .....	" .....	Coupling cars .....	Hand smashed.
29	Dow Loder .....	Other .....	Driving across track; drunk.....	Cut and bruised.
30	Ed. Bradley .....	" .....	Jumped from train .....	Head cut and body bruised.
<b>Nov. 20</b>	Frank Bliss.....	Brakeman .....	Making coupling .....	Arm crushed—amputated.

1	Nov.	8	F. N. Kindall.....	Brakeman.....	Fell from engine.....	Injury not serious.
1		19	W. E. Lindsey.....	"	Coupling .....	Right arm bruised.
1		19	Dan Quinn.....	"	"	Fingers crushed.
1		21	Ellis Moses.....	Other	Caught between bumpers.....	Foot crushed.
1	Dec.	8	Jno. Fitzpatrick.....	Brakeman .....	Train backing .....	Foot caught and bruised.
1	1881.					
1	Jan'y	8	Frank McGary.....	"	Coupling cars .....	Two fingers cut off.
1		11	P. A. Robinson.....	"	Coupling pony to engine .....	Finger crushed.
1		15	T. D. Keegan.....	"	Coupling.....	Thumb crushed.
1		17	A. Andrews.....	"	"	Right arm crushed.
1		25	J. S. Quinn.....	"	"	Right hand badly injured.
1		31	Sam Kastle.....	Other	Walking on track; struck by train.....	Head badly cut.
1	Feb'y	14	George Watson.....	Brakeman .....	Fell under train .....	Badly bruised.
1		14	F. Wisler.....	"	Caught in frog.....	Left foot badly injured.
1		20	R. A. Babcock.....	"	Coupling.....	Arm badly bruised.
1		21	Jas. Kennedy.....	"	Cutting off car.....	Hip broken; arm and hand hurt.
1		21	John Radigan.....	"	"	One finger cut off.
1	March	7	M. Taylor.....	Conductor .....	Coupling.....	Flesh torn from arm and hand.
1		10	Joshua Dunlap.....	Other	Caught between chafing bundlers .....	Arm broken.
1		26	R. L. Dickson.....	Brakeman .....	Coupling .....	Flesh torn from hand.
1		31	Ed. Higgins.....	"	"	Both legs broken.
1	April	13	Thos. Richards.....	Other	Caught between shifting load and end of car.....	Badly bruised and head cut.
1		24	James Dale.....	Conductor .....	Knocked down and run over by cars.....	Right thumb crushed.
1		26	M. Higgins.....	Br. keman .....	Coupling .....	Head and face bruised.
1	May	6	Joshua Hadley.....	Engineer .....	Struck by cars.....	Eye put out.
1		7	Henry Louring.....	Fireman.....	Water gauge burst.....	Badly bruised.
1		11	G. W. Troit.....	Brakeman .....	Train thrown from track.....	Body bruised and ribs broken.
1		14	C. T. Winans.....	"	Struck by shed side of track.....	Chest severely injured.
1	June	6	J. O. McCann.....	"	Thrown from train .....	Head badly cut.
1		21	Wm. Richardson.....	"	Getting off train in motion .....	Thumb cut off.
1		23	Jos. Marsh.....	"	Thrown from train.....	Both legs broken.
1		27	Geo. Ashley.....	"	Fell from train .....	Hand badly crushed.
1		28	Frank Schomer.....	"	Coupling.....	Thumb cut off.
1					Coupling.....	

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Passengers—Getting on or off engine or train in motion.....	1
Employees—Run over in yards, on sidings, or in switching.....	1
Struck by bridge, chute or other obstruction.....	1
Engine or train leaving or thrown from track.....	1
Coupling, or crushed between cars and engine.....	1
Catching foot in frog or between rails—run over.....	2
Others—Getting on or off engine or train in motion.....	1
Falling or thrown from engine or train.....	1
Riding or driving across track.....	4
Lying, walking, falling, or being on track.....	4
<hr/> Total.....	17

## PERSONS INJURED—CAUSES.

Employees—Getting on or off engine or train in motion.....	2
Struck by bridge, chute, or other obstruction.....	1
Coupling, or caught between cars and engine.....	20
Falling or thrown from engine or train.....	3
Collisions.....	1
Run over in yards, on siding, or switching.....	2
Run over, catching foot in frog or between rails.....	1
Engine or train leaving or thrown from track.....	1
Breaking of brake rod, chain or wheel in setting.....	2
Others—Getting on or off engine or train in motion.....	3
Driving or riding across track.....	2
Coupling, or caught between cars and engine.....	3
Lying, walking, falling, or being on track.....	3
Run over in yards, on siding or switching.....	1
<hr/> Total.....	45

## RECAPITULATION.

Killed—Passengers—from misconduct or want of caution.....	1
Employees—from causes beyond their control.....	6
Others—stealing rides.....	2
trespassing, on track, etc.....	8
<hr/> Total killed.....	17
Injured—Employees—from causes beyond their control.....	13
misconduct or want of caution.....	20
Others—stealing rides.....	5
trespassing on track, etc.....	7
<hr/> Total injured.....	45

## TRAIN ACCIDENTS—ENTIRE LINE.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1880.				
Nov. 15	Macedonia .....	Freight, 2d and 3d sections .....	Using steam too long and running carelessly	Rear collision, and damage to engine and two cars.
1881.				
Jan. 5	Hudson.....	Freight, 1st and 2d sections .....	Fog .....	Rear collision; engine and three cars damaged.
28	Kensington.. ..	Freight and hill train .....	Misunderstan'g of train men; collision .....	Both engines and seven cars damaged.
Feb. 7	Rainey's.....	Local freight. ....	Broken wheel .....	Derailment, and nine cars damaged.
11	West of Zoar.....	Mixed .....	Cause unknown .....	Derailment, and five cars damaged.
March 7	Betw'n Summitville and Salineville.....	Freight .....	Train stalling was cut in two.....	Rear collision; engine and one car damaged.
May 7	Portland.....	Freight .....	Horses on track.....	Derailm't; engine damag'd, tender demol'd, and four cars damaged; engineer killed, and fireman inj'd.
26	Cleveland shop.....	Yard train.....	Misplaced switch .....	Derailm't; one car wreck'd and one damaged.
June 14	La Grange .....	Passenger and pay train.....	Misunderstand'g signals	Collision; both engines damaged.
16	Hudson.....	Freight, 2d and 3d sections .....	Engine broke loose.....	Rear collision; engine and caboose damaged.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	4
Collisions—butting.....	2
rear.....	4

Total accidents ..... 10

## Causes of accidents effecting derailment of trains:

Broken truck.....	1
Broken wheel .....	1
Malicious obstruction .....	1
Unexplained .....	1

Total..... 4

## Causes of collisions:

Fog .....	1
Orders—absence of, mistake in, neglect or disobedience to .....	2
Running carelessly .....	1
Runaway engine .....	1
Train breaking in two.....	1

Total..... 6



# ANNUAL REPORT.

Total derailments.....	4
Total collisions .....	6
Total accidents .....	10

*State of Pennsylvania, County of Allegheny, ss. :*

THOS. D. MESSLER, Third Vice President of the Pennsylvania Company, operating Cleveland and Pittsburgh Railroad, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

THOS. D. MESSLER,

*Third Vice President.*

Subscribed and sworn to before me, this 19th day of September, A. D. 1881.

FRANK SEMPLE,

[SEAL.]

*Notary Public.*

CLEVELAND, TUSCARAWAS VALLEY AND WHEELING RAIL-  
WAY COMPANY.

Name of road : Cleveland, Tuscarawas Valley and Wheeling Railway Company.  
By whom owned : Cleveland, Tuscarawas Valley and Wheeling Railway Com-  
pany.  
By whom operated : Cleveland, Tuscarawas Valley and Wheeling Railway  
Company.  
By what authority : Laws of Ohio.  
Name of company making this report : Cleveland, Tuscarawas Valley and  
Wheeling Railway Company.  
General office at Cleveland, O.  
Principal office in Ohio at Grafton, O.  
Address correspondence relating to this report to W. H. Park, Auditor, at Cleve-  
land, O.

HISTORY OF ORGANIZATION AND CONSTRUCTION.  
No change from former reports.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
S. Chamberlain.....	President.....	Cleveland, O.....	
W. S. Streator.....	Vice President.....	".....	
C. L. Cutter.....	Secretary.....	".....	
".....	Treasurer.....	".....	
W. H. Park.....	Auditor.....	".....	
Oscar Townsend.....	General Manager.....	".....	
Wm. H. Grout.....	General Freight Agent.....	".....	
".....	General Ticket Agent.....	".....	
S. Chamberlain.....	} Executive Committee. }	".....	
W. S. Streator.....		".....	
Amasa Stone.....		".....	
R. P. Myers.....		".....	
Jas. Mason.....		".....	

DIRECTORS.

Name.	Residence.	Name.	Residence.
S. Chamberlain.....	Cleveland, O.....	H. B. Perkins.....	Warren, O.
W. S. Streator.....	".....	C. Russell.....	Massillon, O.
Amasa Stone.....	".....	E. P. Rhodes.....	Bridgeport, O.
Jas. Mason.....	".....	W. W. Holloway.....	".....
R. P. Myers.....	".....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$3,000,000 00	
preferred .....	4,180,000 00	
		\$7,180,000 00
Number of shares—common .....	60,000	
preferred .....	83,600	
		143,600
Par value of each—common .....		\$50 00
preferred .....		50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$3,000,000 00	
preferred .....	4,180,000 00	
		\$7,180,000 00
Amount subscribed—common.....		1,290,150 00
Total paid in capital stock—common .....		1,205,950 00
Increase since June 30, 1880—common.....		8,000 00
Average amount paid in per mile of single main track (158.5 miles).....		7,608 52
Proportion of same for Ohio (158.5 miles), all.		

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.
For subscription paid in municipal, county or town bonds..	24,119	\$1,205,950
Total.....	24,119	\$1,205,950

Stockholders, residents of Ohio, 502.

Amount of stock held by them June 30, 1881, \$795,550.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage..	L. S. & T. V. R'y Co...	Oct. 1, 1871	Oct. 1, 1901	7	\$2,000,000 00	\$2,000,000 00
" ..	E. & B. R. R'y Co.....	May 1, 1872	May 1, 1892	7	180,000 00	180,000 00
" ..	C. T. & W. R'y Co.....	Oct. 1, 1878	Oct. 1, 1898	7	700,000 00	700,000 00
2nd and 3rd mortgage...	" ..	April 1, 1877	July 1, 1907	7	2,000,000 00	1,330,000 00
2nd and 3rd mortgage, bond scrip.						8,079 03
Total .....						\$4,218,079 03

Average amount per mile of single main track (158.50 miles) ..... \$26,612 48  
Proportion of same for Ohio, all.

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$315,522 36	
All other debts, current credit balances, etc.....	551,731 98	
Total unfunded debt.....	867,254 34	
Cash securities, debit balances, etc., available to payment	182,473 43	
Net unfunded debt .....		\$684,780 91
Average amount per mile of single main track, 158.5.....	\$4,320 38	
Proportion of same for Ohio, all.		
Increase since June 30, 1880.....	86,543 20	
Total net debt liabilities .....		4,902,859 94
Average amount per mile of single main track.....	30,932 87	
Proportion of same for Ohio, all.		
Total of paid in stock and debt.....		6,108,809 94
Total average amount per mile.....	38,541 39	
Proportion of same for Ohio, all.		

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expend- itures to July 1, 1881.
Right of way.....	\$48,555 31	\$77 58	\$48,632 89
Civil engineering.....	22,706 84	470 72	23,177 56
Grading and masonry .....	305,208 89		305,208 89
Bridges, trestles and culverts.....	201,499 19	8,661 66	210,160 85
Timber and ties .....	78,551 04	38 47	78,589 51
Superstructure .....	1,960 21	299 16	2,259 37
Iron rails, chairs and spikes.....	320,400 78	195 00	320,595 78
Fencing.....	2,434 88	19,507 59	21,942 47
Passenger and freight stations. ....	9,710 77	5,790 24	15,501 01
Engine and car houses.....	422 53	113 20	535 73
Machine shops, machinery and fixtures...	6 75	29 25	36 00
Other buildings and fixtures .....	8,410 48	1,526 35	9,936 83
Telegraph .....	1,940 07	286 62	2,226 69
Real estate.....	34,103 24		34,103 24
Interest and discount.....	22,996 57	4,634 29	27,630 86
Contingent expenses .....	27,946 68	336 14	28,282 82
Tunnels .....	79,644 16		79,644 16
Ballasting.....	63,168 18	7,940 76	71,108 94
Siding, branches and track laying .....	43,411 06	12,328 74	55,739 80
Gravel and hand cars.....	1,872 32		1,872 32
Total expenditures for construction	\$1,274,949 95	\$62,235 77	\$1,337,185 72

## ROAD ACQUIRED BY PURCHASE.

At judicial sale January 26, 1875, purchased for.....	\$4,375,718 15
Subsequent expenditures for construction .....	154,307 7
Total expended for construction and purchase .....	5,867,211 60
Average cost per mile of road owned by company (single main track, 158.5 miles) .....	37,017 11

Proportion of same for Ohio, all.

Cost of equipment owned by company..... \$315,118 96

Locomotives, first-class passenger cars, second-class passenger cars, box freight cars, platform cars, baggage cars, mail and express cars, sleeping cars, section cars, hand-cars, snow-plows, caboose cars, Directors and Superintendent's cars, pay-cars, dump-cars, track-laying cars, wrecking cars—charged as an entirety to equipment and not classified.

All other rolling stock, tools, machinery, etc..... \$6,423 16

Total cost of railroad equipment owned by company..... 321,542 12

Additions within the year ending June 30, 1881..... 146,026 47

Average amount per mile (of single main track 158.5 miles)..... 921 30

Total for road and equipment..... 6,188,753 72

Total average amount per mile (of single main track, 158.5 miles)..... 39,045 76

Proportion of same for Ohio: All.

#### LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Lorain, Ohio, to West Wheeling, Ohio.....	158.50	same.

Total single main track.....	158.50	same.
------------------------------	--------	-------

Aggregate of sidings and other tracks.....	45.31	“
--	-------	---

Total length laid with rail computed as single track.....	203.81	same.
---	--------	-------

Laid with steel rail.....	92.00	“
---------------------------	-------	---

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Lorain.....	22.67	9.39	32.06
Medina.....	17.81	3.41	21.22
Wayne.....	12.75	6.43	19.18
Summit.....	.92	.35	1.27
Stark.....	24.49	11.75	36.24
Tuscarawas.....	30.94	8.08	39.02
Harrison.....	15.01	1.00	16.01
Belmont.....	33.91	4.90	38.81
Totals.....	158.50	45.31	203.81
Steel rail.....	92.00		

#### GAUGE, GRADE, RAILS, ETC.

Gauge..... 4 feet 8½ in.

Grade—Maximum per mile—about..... 50 feet.

Longest maximum “..... 15,840 feet.

Aggregate length of maximum—about..... 31,680 feet.

Rail—Iron—On road..... 665 miles.

Average weight per yard..... 56 lbs.

Steel—On road .....	92 miles.
Average weight per yard .....	56 lbs.
Ties—Average number per mile.....	2,640
Number laid during the year.....	34,571
Ballasted—On whole line .....	158.5 miles.
In Ohio.....	All.
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 30; greatest age, 9 years; aggregate length.....	1,617 feet.
Combination, 33; greatest age, 2 years; aggregate length.....	3,547 "
Total.....	5,164 feet.
Trestles—153; greatest age, 9 years; greatest height, 60 feet; greatest length, 686 ft.; aggregate length, 17,827 feet.	
Length of shortest span of truss, 30 ft.; of longest, 180 ft.; greatest length of beams between points of support, if not trussed, 20 ft.	
Greatest space between cross ties upon bridges and trestles, 9 inches; length of ties, 8 feet and 6 inches.	
Number of track stringers, 2 to 6.	
Are all bridges and trestles provided with guard rails? Yes.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Annually, and as often as Superintendent of Bridges may deem necessary.	
Are the examinations analytical, and are they made by a competent person? Yes.	

Tunnels—Wood, 4; aggregate length, 2,653.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	300	
Kind of fencing, as follows:		
Post and board (average cost per rod \$1.00).....	192	
Wire (average cost per rod, 75 cts.).....	108	
Average cost of fencing, \$87,360.		
Average cost of same per rod, 91 cts.		
Length of road unfenced, and the reason therefor through towns and villages.....	8	All.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Lake Shore and Michigan Southern R'y at Elyria, O.  
Cleve., Col., Cin. & Indianapolis R'y at Grafton, O.  
New York, Pennsylvania & Ohio R. R. at Russell, O.  
Cleveland, Mt. Vernon & Columbus R. R. at Warwick, O.  
Pittsburgh, Ft. Wayne & Chicago R'y at Massillon, O.  
Cleveland & Marietta R. R. at Canal Dover, O.

Pittsburgh, Cincinnati & St. Louis R'y at Uhrichsville, O.

Cleveland & Pittsburgh R. R. at Bridgeport, O.

Number of crossings of highways at grade, 130.

Number of highway bridges 18 feet above track, 2.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated .....	158.5; in Ohio.....	158.5
Miles of same owned by railroad company and W. U. Telegraph Co., jointly.....	158.5; " .....	158.5

### STATIONS.

Passenger and freight.....	35; in Ohio.....	35
Number with telegraph communication .....	24; " .....	24
Number of same operated by railroad company .....	35; " .....	35
Is pay received for messages sent over line owned by railroad company? No.		

### ROLLING STOCK.

Locomotives.....	32; average weight—lbs.....	120,750
Express and baggage cars.....	5; .....	30,000
Passenger cars .....	12; .....	38,000
Pay car.....	1; .....	38,000
Freight cars .....	1,857; .....	16,500
Other cars.....	17; .....	20,000

Above includes not owned by company reporting.

Locomotives .....	10; owned by R. R. Equipment Company (leased).	
Express and baggage cars.....	2; " Oliver Adams, Agent,	"
Passenger cars .....	5; " " "	"
Gondola cars.....	700; " " "	"
" .....	500; " R. R. Equipment Company	"
Freight cars .....	100; " Erie Car Works	"

Terms of service: Monthly installments.

Number of locomotives equipped with train brakes, 9.

Kind of brake: Westinghouse Automatic, 8, and American Steam Brake, 1.

Number of cars equipped with train brakes, 18.

Kind: Westinghouse Automatic.

Number of passenger cars with "Miller Platform", 13.

Method of bridging between passenger cars, when two or more are run in trains:

Miller Platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Bissell

Safety Car Stove.

Means of lighting same: Mineral seal oil, 300°.



SPEED OF TRAINS.

Express passenger, average rate, including stops .....	27 miles per hour.
Mail and accommodation .....	25 "
Freight trains .....	12 "

EMPLOYEES.

General Manager.....	1
Telegraph operators .....	18
Engineers .....	25
Baggagemen.....	5
Flagmen, switch-tenders and watchmen .....	2
Laborers .....	12
Clerks .....	12
Train dispatchers.....	3
Firemen.....	25
Wipers.....	18
Mechanics .....	70
Conductors.....	21
Brakemen.....	54
Station Agents .....	35
Section men.....	210
Other employees .....	114
<hr/>	
Total number employed by company in operating line.....	625
Proportion for Ohio.....	625

EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union and Adams.  
 Terms: Forty per cent. of gross earnings.

RATES OF TRANSPORTATION.

PASSENGERS.

Fare charged per mile—	Highest.	Lowest.
For distances less than 8 miles, 1½.....	6.67 Cts.	6.67 Cts.
For distances over 8 miles—1st class .....	3	3

FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	30 miles.	150 miles.
First class .....	.56 Cts.	.26 Cts.
Second class .....	.46	.20
Third class.....	.40	.16
Fourth class .....	.26	.13
Fifth class—grain .....	.20	.08

## Rate per ton per mile on freight carried less than 30 miles :

	5 miles.	28 miles.
First class .....	30 Cts.	5.30 Cts.
Second class .....	30	5.30
Third class .....	24	5
Fourth class .....	20	5
Fifth class—grain .....	18	4.20

## Rate per ton per mile on freight carried more than 30 miles :

	32 miles.	150 miles.
First class .....	5	4.53
Second class .....	5	3.73
Third class .....	5	3.20
Fourth class .....	4.30	2.26
Fifth class—grain .....	3.75	1.73

## Rate per ton per mile for—

Coal—Carried ten miles or more.....	10 mi.,	5 Cts.,	150 mi.,	1.40 Cts.
Carried less than ten miles.....	2 “	20	9 “	5
Pig iron—Carried ten miles or more.....	10 “	5	150 “	1.40
Carried less than ten miles.....	2 “	20	9 “	5
Limestone—Carried ten miles or more.....	10 “	5	150 “	1.40
Carried less than ten miles.....	2 “	20	9 “	5
Iron ore—Carried ten miles or more.....	10 “	5	150 “	1.40
Carried less than ten miles.....	2 “	20	9 “	5
Undressed stone or lumber—Carried 10 miles or more	10 “	5	150 “	1.40
Carried less than 10 mi...	2 “	20	9 “	5

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Fencing in Ohio—Miles of single fence built (average cost per rod, 75 cts.), 90.

Ballasting—Miles of main track ballasted, 57.5.

Rail laid—Steel, 56 lbs. per yard—miles of track, 4.0.

New iron, 56 “ “ 3.5.

Train mileage—Passenger.....	212,456
Freight.....	441,484
Construction .....	53,626

Total..... 707,566

Car mileage—Passenger.....	424,912
Express and baggage .....	212,456
Freight—loaded.....	7,380,066
empty.....	3,690,033
Caboose .....	441,484
Construction and other .....	1,179,772

Total..... 13,328,723

Fuel consumed—Wood, 860½ cords; coal, 24,809 tons; total cost ..... \$19,962 73

Losses, etc., paid—On goods and baggage..... • 463 07



Manufactures, including agricultural implements.....	26,802	2.97
Merchandise .....	10,692	1.18
Miscellaneous .....	17,872	1.97
	<hr/>	<hr/>
Total tonnage yielding revenue.....	903,919	100
Supplies for company's use.....	75,013	

EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30,

## EARNINGS.

Passenger transportation—local .....	\$87,513	55
through .....	31,120	18
Total.....		\$118,633 73
Freight transportation—local .....	\$371,505	46
through .....	305,267	60
Total .....		\$676,773 06
Mail service.....		10,347 80
Express service.....		4,749 55
Other sources.....		19,872 96
Total earnings of line operated included in this report.....		\$830,377 10

OPERATING EXPENSES.

Maintenance of way and structures .....	\$156,940	26
Maintenance of cars.....	40,902	60
Motive power .....	52,208	39
Conducting transportation.....	207,528	14
General expenses:		
Taxes in Ohio .....	12,717	37
Salaries .....	17,409	32
Other general expenses of operating.....	15,724	96
	<hr/>	
Total operating expenses, being 60.63 per cent. of earnings.....	\$503,431	04
Net earnings of 158.5 miles operated.....	326,946	06
Rentals paid (for use of road, track, depots, equipment), etc.:		
Rent.....	\$2,363	86
Operating tug Hawley.....	613	20
	<hr/>	
		\$2,977 06
Net income over operating expenses and rentals paid .....	323,969	00
Percentage of same to capital stock and debt, 5.30.		
Percentage of to total means applied to construction, etc., 5.52.		
Per mile of earnings, \$5,238.97; proportion for Ohio (158.5 miles) .....		All.
operating expenses, \$3,176 22	"	All.
net earnings, \$2,062 75	"	All.

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock.....	\$3,273 61	
Sale of real estate.....	6,567 33	
Increase of floating debt.....	5,178 63	
	<hr/>	\$15,019 57

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$49,000 00	
Interest on floating debt.....	16,476 90	
Construction of new work.....	62,235 77	
Additional equipment .....	156,613 64	
Bills receivable, increased.....	2,635 15	
General supplies, increase.....	2,111 54	
Paid over draft at bank June 30, 1880 .....	20,515 44	
	<hr/>	\$309,588 44

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$1,205,950 00	
“ not issued.....	84,200 00	
First mortgage, C., T., V. & W. Ry. Co.....	700,000 00	
“ L., S. & T. V. Ry. Co.....	2,000,000 00	
“ E. & B. R. Ry. Co .....	180,000 00	
Mortgage of April 1st, 1877, and bond scrip.....	1,338,079 03	
Unfunded liabilities.....	457,800 00	
Bills payable .....	315,522 36	
Accounts audited .....	65,118 64	
Labor .....	28,813 34	
Increase account.....	17,941 93	
	<hr/>	\$6,393,425 30

## ASSETS.

Cost of road and equipment.....	\$6,188,753 72	
Accounts and bills receivable.....	18,736 21	
General supplies.....	16,598 15	
Real estate .....	21,958 42	
Stock subscribers.....	58,484 84	
Investment account.....	53,893 83	
Tug Hawley.....	5,600 00	
Cash .....	29,400 13	
	<hr/>	\$6,393,425 30

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880. July 2	Crook Wells.....	.....	Lay with head on rail and body out- side, on curve, about one mile north of Elyria; struck by passenger train.	Killed.
2	Oct. 10	L. Criss.....	Brakeman.....	Foot caught between iron rail and stake on car at Bridgeport.....	Bone broken in ankle.
3	Oct. 11	J. W. Conway.....	".....	Coupling cars.....	Bone broken in hand.
4	Nov. 5	G. Clary.....	".....	".....	Injured internally; died in 40 mins.
5	Dec. 3	G. Henderson.....	Passenger.....	Derailment of two coaches.....	Slight.
	"	Mathias Springer.....	".....	".....	"
	"	Mrs. Matilda Butler.....	".....	".....	"
6	Dec. 22	R. Monasmuth.....	Brakeman.....	Coupling cars.....	Fingers bruised.
	881. Jan. 13	Ed. Hopkins.....	".....	".....	Finger and thumb taken off.
7	Jan. 13	W. S. Myers.....	".....	Uncoupling cars with foot—train in motion.....	Bone broken in foot.
8	Jan. 17	G. Wright.....	".....	Coupling cars.....	Two fingers bruised.
9	Jan. 29	J. C. Grant.....	".....	Fell from train in motion.....	Killed.
10	Feb. 19	Harvey Hunt.....	".....	Coupling cars.....	Hand bruised.
11	March 5	J. W. Hall.....	".....	".....	Finger pinched.
12	March 25	V. H. Osgood.....	Conductor.....	".....	Finger off and hand pinched.
13	April 20	C. Grunniwald.....	Car repairer.....	Stepped on track in front of yard engine.....	Both legs cut off; died in few hours; carelessness on his part.
14	April 26				Killed.
15	May 24	Archy Cass.....	Trackman.....	Walking on track near Bridgeport.....	Arm broken.
16	June 1	Thomas Harley.....	Brakeman.....	Riding on hand-car—struck by train.....	Punched through breast—injury slight.
17	June 10	A. Hilliker.....		Coupling cars.....	Cutting off left foot and breaking left leg—carelessness on his part.
18	June 13	John Fabrian.....		Stepped on track in front of train.....	Slightly bruised on head and shoul- der—want of caution on his part.
19	June 20	J. Keizer.....	Teamster.....	Attempted to cross track in face of yard train.....	

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Run over in yards, on sidings, or in switching.....	1
Falling or thrown from engine or train.....	1
Coupling, or crushed between cars and engine.....	1
Others—Lying, walking, falling, or being on track.....	2
<b>Total.....</b>	<b>5</b>

## PERSONS INJURED—CAUSES.

Passengers—Engine or train leaving or thrown from track.....	4
Employees—Coupling, or caught between cars and engine.....	10
On hand car struck by engine .....	1
Others—Driving or riding across track.....	1
Lying, walking, falling, or being on track .....	1
<b>Total.....</b>	<b>17</b>

## RECAPITULATION.

Killed—Employees—from misconduct or want of caution.....	3
Others—at stations and highway crossings.....	2
<b>Total killed .....</b>	<b>5</b>
Injured—Passengers—from causes beyond their control.....	4
Injured—Employees—misconduct or want of caution .....	11
Others—At stations and highway crossings.....	2
<b>Total injured.....</b>	<b>17</b>

## TRAIN ACCIDENTS—ENTIRE LINE.

*Return of accidents to trains occurring within the year ending June 30, 1881.*

Number.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880.				
2	Sept. 14	Massillon.....	Switcher.....	Stock on track.....	Two cars broken.
3	Oct. 21	Tuscarawas.....	Freight.....	Horse in trestle.....	Engine off track; no damage.
4	Nov. 9	New Massillon.....	" .....	Misunderstanding of orders.....	Two engines and 5 cars slightly damaged.
5	Dec. 2	Chippewa Lake.....	" .....	Broke in two.....	Four cars damaged.
6	3	Henderson.....	Passenger .....	Track spread.....	Two coaches slightly damaged.
7	7	Summit.....	Freight.....	Train got start down hill; came together....	Struck train on siding, breaking 7 drawheads.
8	1881.				
9	Feb. 5	Massillon.....	" .....	Engine broke frog.....	Ten cars off track; no damage.
10	18	1½ miles south of Urbichsville.....	Passenger.....	Tank axle broke....	Two coaches off track; no damage.
11	23	Seville.....	Freight.....	Engine blew out cylinder head.....	No damage.
12	Apr. 4	Silver Creek.....	" .....	Misunderstanding signals.....	Engine and 3 cars damaged.
13	9	Elyria.....	" .....	Switch open.....	Front of engine and 2 cars damaged.
14	June 2	Easton.....	" .....	Switch wrong.....	Engine and three cars slightly damaged.
15	3	Tuscarawas.....	" .....	Not understanding signals and location.....	Engine damaged.



SUMMARY OF TRAIN ACCIDENTS.

Number:	
Accidents causing derailment of trains.....	2
Accidents not resulting in derailment of trains.....	9
Collisions—bumping.....	1
Crossing .....	1
<hr/>	
Total accidents.....	13
Causes of accidents effecting derailment of trains:	
Broken axle.....	1
Broken drawhead.....	1
Cattle on track.....	2
Misplaced switch.....	2
<hr/>	
Total.....	6
Causes of Collisions:	
Orders—absence of, mistake in, neglect or disobedience to.....	1
Train breaking in two.....	1
<hr/>	
Total.....	2
Cause of accidents not resulting in derailment of train:	
Broken axle.....	1
Cylinder head burst or blown out.....	1
Other causes.....	3
<hr/>	
Total.....	5
Total derailments .....	6
Total collisions.....	2
<hr/>	
Total accidents.....	13

State of Ohio, County of Cuyahoga, ss.:

Oscar Townsend, General Manager of the Cleveland, Tucsarawas Valley and Wheeling Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

OSCAR TOWNSEND,

General Manager.

Subscribed and sworn to before me, this 27th day of September, A.D. 1881.

[SEAL.]

G. W. SHUMWAY,

Notary Public.

## COLLEGE HILL RAILROAD COMPANY.

Name of road: College Hill Railroad.

By whom owned: College Hill Railroad Company.

By whom operated: College Hill Railroad Company.

By what authority: Charter.

Name of person making this report: John R. Davey, President College Hill Railroad Company.

General office at Cincinnati, Ohio.

Principal office in Ohio at Cincinnati, Ohio.

Address correspondence relating to this report to John R. Davey, at Cincinnati, Ohio.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
John R. Davey .....	President .....	Cincinnati, O. ....	.....
Chas. R. Wild .....	Secretary .....	" .....	.....
Robert Simpson .....	Treasurer .....	" .....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
John R. Davey .....	College Hill.	S. F. Cary .....	College Hill.
Robt. Simpson .....	"	C. S. Cheever .....	Cincinnati.
Chas. R. Wild .....	"	W. C. Huntington .....	College Hill.
J. F. Wright .....	Mt. Healthy.		

### CAPITAL STOCK.

#### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$300,000 00
Number of shares—common .....	6,050
Par value of each—common .....	\$50

#### CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$300,000 00
Amount subscribed—common .....	300,000 00
Total paid in capital stock—common, 20% .....	97,000 00

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For subscription paid in municipal, county or town bonds—amount of common .....	\$10,000 00
For services rendered—amount of common.....	88,000 00

## FUNDED DEBT.

Kind of bond or obligations, first mortgage; if and how secured, mortgage; rate of interest, 7 per cent.; amount of authorized issue, \$60,000; amount actually issued, \$60,000.	
Average amount per mile of single main track (6 miles) .....	\$10,000 00
Proportion of same for Ohio, all.	

## CHARACTERISTICS, Etc.

Length in Ohio, distributed as follows:

Hamilton county—main track, all; branches, all; double track, all; sidings, etc., all; total, all.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge, 3 feet.

Grade—Maximum per mile, 250 feet.

Rail—Iron—Average weight per yard, 35 lbs.

Number of crossings of highways at grade in this State without protection, 5.  
over railroad, 2.

Number of highway bridges less than 18 feet above track, 2.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? No.

## STATIONS.

Passenger and freight.....	8
----------------------------	---

## ROLLING STOCK.

Locomotives.....	2
Passenger cars.....	2
Freight cars.....	5
Other cars .....	4
Number of locomotives equipped with train brakes, none.	
Number of cars equipped with train brakes, all.	
State methods of heating cars used for the transportation of passengers: Stoves.	
Means of lighting same: Candles.	

## EMPLOYES.

Engineers.....	1
Laborers .....	4
Firemen .....	1

Mechanics .....	1
Conductors.....	1
Brakemen.....	1

Total number employed by company in operating line..... 9

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.
Fare charged per mile—For distances less than 8 miles.....	4c.	2½c.

## FREIGHT.

Rate per ton per mile for coal—Carried less than ten miles .....	30c
--	-----

## DOINGS OF THE YEAR ENDING JUNE 30.

Fuel consumed—Coal, about 500 tons ; total cost, about 14 cents per bushel.

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS FOR MAY AND JUNE.

Passenger transportation—local .....	\$1,400 40
Freight transportation—local .....	102 96
Mail service .....	150 00

Total earnings of line operated included in this report..... \$1,652 65

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$303 88
Maintenance of cars .....	44 84
Motive power .....	360 60
Conducting transportation.....	350 00

Total operating expenses..... \$1,059 68

Net earnings of 6 miles operated.

*State of Ohio, County of Hamilton, ss.:*

John R. Davey, President of the College Hill Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

JOHN R. DAVEY,

*President.*

Subscribed and sworn to before me, this 8th day of December, A. D. 1881.

# COLUMBUS, CHICAGO AND INDIANA CENTRAL RAILWAY COMPANY.

Name of road: Columbus, Chicago and Indiana Central Railway.

By whom owned: Columbus, Chicago and Indiana Central Railway Company.

By whom operated: Pittsburgh, Cincinnati and St. Louis Railway Company.

By what authority: Lease.

Name of company making this report: Columbus, Chicago and Indiana Central Railway Company.

General office at Columbus, Ohio.

Branch office at 57 Broadway, New York City.

Address correspondence relating to this report to Gordon Moodie, Secretary, at Columbus, Ohio.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
B. E. Smith .....	President .....	Columbus, O.....	.....
William Bond.....	Vice President.....	34 Broad St., N. Y. City.....	.....
W. R. Fosdick, } .....	Receivers .....	66 Broadway, " .....	.....
Jas. A. Roosevelt, }			
Gordon Moodie. ....	Secretary and Treasurer ...	Columbus, O.....	.....
C. J. Osborn.....	Executive Committee }	34 Broad St., N. Y. City.....	.....
William Bond.....		" " .....	.....
John Hoey.....		59 Broadway, " .....	.....
W. B. Dinsmore.....		" " .....	.....
B. E. Smith .....		Columbus, O.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
C. J. Osborn .....	New York.	R. H. Townsend, Jr.....	Phila., Pa.
Wm. Bond .....	"	Milton Courtright.....	Erie, Pa.
John Hoey .....	"	W. H. Barnum .....	Lime Rock, Con.
W. B. Dinsmore.....	"	Jas. H. Howe.....	Chicago, Ill.
C. F. Timpson.....	"	A. J. Crawford.....	Terre Haute, Ind
C. J. Canda .....	"	R. O. Smith .....	Columbus, O.
R. P. Flower .....	"	B. E. Smith.....	"
E. L. Sanford.....	"		

## CAPITAL STOCK.

Capital stock authorized by law	Amount—common .....	\$15,000,000 00
	No. shares—common .....	150,000
	Par value of each—common .....	\$100
Total paid in capital stock—common issued .....		\$14,345,085 39
of old Co's outstanding .....		32,306 06
		<hr/> \$14,377,391 45
Average amount paid in per mile of single main track, 582 miles .....		24,703 42
Proportion of same for Ohio, 136 miles .....		3,359,665 12
Stockholders, residents of Ohio .....		29
Amount of stock held by them June 30, 1881 .....		\$31,700 00
Agents authorized to transfer stock: Union Trust Co., 73 Broadway, New York City.		
Number of shares transferred within the year at such agencies, 263,860.		

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.
1st mortgage .....		Various dates....	Various times..	7	\$14,981,060 00
2d mortgage .....		" " .....	" " .....	7	881,196 88
Convertible incomes .....		February, 1870...	February, 1890	No coupons.	9,551,000 00
Incomes .....	Not secured .....	Various dates....	Various times..	6 and 7	89,184 77
Total .....					<hr/> \$25,502,441 65

Average amount per mile of single main track, 582 miles...	\$43,818 62
Proportion of same for Ohio, 136 miles .....	\$5,959,332 32

## OTHER INDEBTEDNESS.

Net unfunded debt .....	\$100,696 71
Average amount per mile of single main track (582 mi.)...	\$173 02
Proportion of same for Ohio (136 mi.) .....	23,530 72
Total of paid in stock and debt .....	39,879,833 10
Total average amount per mile (582 miles) .....	\$68,522 04
Proportion of same for Ohio (136 miles) .....	9,318,997 44

## COST OF ROAD EQUIPMENT, ETC.

Total for road and equipment .....	\$39,922,529 81
Total average amount per mile (of single main track, 582 miles) .....	68,595 41
Proportion of same for Ohio (136 miles) .....	9,328,975 76

*State of Ohio, County of Franklin, ss.:*

Gordon Moodie, Secretary of the Columbus, Chicago & Indiana Central Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

GORDON MOODIE,

*Secretary.*

Subscribed and sworn to before me, this 22d day of September, A. D. 1881.

[SEAL.]

CASSIUS C. CORNER,

*Notary Public for Franklin county, O.*



# PITTSBURGH, CINCINNATI & ST. LOUIS RAILWAY COMPANY, OPERATING COLUMBUS, CHICAGO & INDIANA CENTRAL RAILWAY.

Name of road: Columbus, Chicago and Indiana Central Railway.

By whom owned: Columbus, Chicago and Indiana Central Railway Company.

By whom operated: Pittsburgh, Cincinnati and St. Louis Railway Company.

Name of Company making this report: Pittsburgh, Cincinnati and St. Louis Railway Company.

General office at Pittsburgh, Pa.

Principal office in Ohio at Columbus, O.

Address correspondence relating to this report to J. W. Renner, Auditor, at Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS OF COMPANY OPERATING.

Name.	Office.	Address.	Salary.
George B. Roberts.....	President.....	Philadelphia, Pa.....	
J. N. McCullough.....	1st Vice President.....	Pittsburgh, ".....	
Wm. Thaw.....	2d ".....	" ".....	
Thos. D. Messler.....	3d " and Comptroller.....	" ".....	
John E. Davidson .....	Assistant Comptroller .....	" ".....	
M. C. Spencer.....	Treasurer.....	" ".....	
John W. Renner.....	Auditor .....	" ".....	
D. W. Caldwell.....	General Manager.....	" ".....	
S. B. Liggett.....	Secretary.....	" ".....	
S. W. White.....	Assistant Secretary.....	Philadelphia, ".....	
M. J. Becker.....	Chief Engineer .....	Pittsburgh, ".....	
E. A. Ford .....	Gen'l Pass. and Ticket Agt.....	" ".....	
Wm. Stewart.....	General Freight Agent .....	" ".....	
F. H. Kingsbury.....	Assistant Gen'l Frei't Agt.....	Columbus, Ohio.....	
J. N. McCullough.....	} Executive Committee.. }	Pittsburgh, Pa.....	
Wm. Thaw.....		" ".....	
Thos. D. Messler.....		" ".....	
John P. Green .....		Philadelphia, Pa.....	
Wm. H. Barnes .....		Pittsburgh, Pa.....	

The salaries paid these officers are general in their nature, and are applicable to all the lines operated by this company.

## DIRECTORS OF OPERATING COMPANY.

Name.	Residence.	Name.	Residence.
George B. Roberts.....	Philadelphia, Pa.....	J. P. Wetherill .....	Philadelphia, Pa.....
J. N. McCullough .....	Pittsburgh, Pa.....	W. H. Barnes.....	Pittsburgh, Pa.....
Wm. Thaw.....	" .....	D. S. Gray.....	Columbus, O.....
Thos. D. Messler .....	" .....	R. Sherrard, Jr .....	Steubenville, O.....
H. H. Houston .....	Philadelphia, Pa.....	A. J. Cassatt .....	Philadelphia, Pa.....
Wistar Morris.....	" .....	John P. Green.....	" .....
J. N. DuBarry.....	" .....		

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Columbus, O., to Indianapolis, Ind.....	187.1 miles.	115.3 miles.
“ Bradford Junction, O., to Chicago, Ill..	231.0	20.6
“ Richmond J'n, Ind., to Anoka J'n, Ind.	102.2	.....
“ Peoria Junction, Ind., to State Line, Ill.	60.2	.....
Total single main track.....	580.5	135.9
Double track.....	7.2	.....
Aggregate of sidings and other tracks.....	80.3	25.4
Total length laid with rail computed as single track...	668.0	161.3
Laid with steel rail.....	242.0	127.5

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Franklin.....	13.52	6.31	19.83
Madison.....	4.52	0.69	5.21
Union.....	13.05	0.97	14.02
Champaign.....	30.36	5.85	36.21
Miami.....	22.06	6.92	28.98
Darke.....	46.68	4.41	51.09
Preble.....	5.69	0.27	5.96
Totals.....	135.88	25.42	161.30
Steel rail .....			

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 9 inches.
Grade—Maximum, per mile.....	66 feet.
Longest maximum.....	6366 feet.
Aggregate length of maximum.....	6366 “
Curvature—Shortest radius.....	1146 “
Aggregate length of shortest radius.....	6758 “
Aggregate length of curves.....	227214 “
Aggregate length of tangent .....	537.513 miles.
Rail—Iron—On road.....	341 “
Average weight per yard .....	60 pounds.
Steel—On road .....	242 miles.
Average weight per yard.....	60 pounds.
Ties—Average number per mile .....	2,800
Number laid during the year.....	261,753
Ballasted—On whole line .....	580.5 miles.
In Ohio.....	127.5 “
With gravel and sand.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood .....	11	;	greatest age, 7 years; aggregate length.....	964 feet.
Iron.....	4	;	2	..... 984
Stone arch	7	;	14	..... 85

Total..... 2,033

Trestles—56; greatest age, 9 years; greatest height, 33 feet; greatest length, 361; aggregate length, 2,980 feet.

Length of shortest span of truss, 10 ft.; of longest, 140 ft.; greatest length of beams between points of support, if not trussed, 21 ft.

Greatest space between cross ties upon bridges and trestles, 9 inches; length of ties, 9 feet.

Number of track stringers, 2.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? At least once a month.

Are the examinations analytical, and are they made by a competent person? Yes.

Fencing—Average and aggregate cost.	Whole line.	In Ohio.
Number miles fencing, computed as single line.....	693	231
Kind of fencing, as follows:		
Post and board, (average cost per rod, \$1.00).....	255	142
Rail, (average cost per rod, unknown) .....	245	32
Wire, (average cost per rod, 75 cents) .....	190	57
Hedge, (average cost per rod, unknown) .....	3	.....
Average cost of same per rod, 85 cents .....	.....	.....
Length of road unfenced, and the reason therefor: Failure of landowners to comply with contracts .....	234½	11½

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Columbus, Springfield and Cincinnati Railroad at Columbus, O.

Columbus and Hocking Valley Railroad at Columbus, O.

Cleveland, Columbus, Cincinnati and Indianapolis Railroad at Milford Centre.

Cincinnati, Sandusky and Cleveland Railroad at Urbana, O.

Atlantic and Great Western Railroad at Urbana, O.

Dayton and Michigan Railroad at  $\frac{8}{10}$  mile east of Piqua, O.

Toledo, Delphos and Burlington Railroad at Covington.

Dayton and Union Railroad at Greenville.

Number of crossings of highways at grade in this State without protection, 141.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 3.

Number of crossings of highways over railroad, 4.

“ “ “ under railroad, 3.

Number of highway bridges 18 feet above track, 3.

“ “ less than 18 feet above track, 1.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated, 580.5; in Ohio, 135.9.

### STATIONS.

Passenger and freight, 129; in Ohio, 28.

Number with telegraph communication, 76; in Ohio, 19.

Number of same operated by railroad company, 76; in Ohio, 19.

Is pay received for messages sent over line owned by railroad company? Western Union Telegraph Company receive pay for all messages, except those relating company's business.

## ROLLING STOCK.

Locomotives .....	163; average weight, lbs.....	98,000
Express and baggage cars .....	30; “ “ .....	31,000
Passenger cars .....	65; “ “ .....	39,000
Freight cars .....	1,545; “ “ .....	18,000
Other cars—Caboose .....	55; “ “ .....	9,000

Above includes not owned by company reporting.

Locomotives..... 10; owned by Pennsylvania Company.

“ ..... 28; “ Pittsburgh, Cincinnati & St. Louis R'y Co.

Terms of service: For the 10 locomotives belonging to the Pennsylvania Company, this company pays 7 per cent. per annum on their valuation; for the 28 locomotives, 7 per cent. per annum on their original cost, and repairs are charged.

Number of locomotives equipped with train brakes, 39.

Kind of brake: Westinghouse.

Number of cars equipped with train brakes, 90.

Kind: Westinghouse.

Number of passenger cars with Miller Platform, none.

Method of bridging between passenger cars, when two or more are run in trains Janney platform and coupler.

Are all cars run on this road heated and lighted as prescribed by law? No.

State methods of heating cars used for the transportation of passengers: Passenger cars are heated by wood and coal stoves, Spears & Dripps heaters; sleeping, parlor and drawing room cars are heated by Baker's Patent Car Warmers and Winslow stoves.

Means of lighting same: Candles and oil lamps.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	30 miles per hour.
Mail and accommodation, .....	20       "
Freight trains, .....	10       "

## EMPLOYEES.

Superintendents .....	2
Telegraph operators .....	126
Engineers .....	162
Baggagemen.....	26
Flagmen, switch-tenders and watchmen .....	184
Laborers .....	350
Clerks .....	161
Train dispatchers.....	8
Firemen .....	173
Wipers.....	66
Mechanics .....	222
Conductors .....	133
Brakemen .....	303
Station agents .....	93
Section men.....	1,206
Other employees.....	868
Total number employed by company in operating line.....	4,113
Proportion for Ohio.. .....	1,229

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams, American and United States Express Companies.

Terms: Adams—Between Columbus and Indianapolis, 40 % of gross receipts (not including oyster business), and 70 % of gross receipts of oyster traffic.

American—Between Indianapolis and Richmond, Ind., \$15.54 per day.

Between Richmond and Chicago, Ill., \$50.46 per day.

United States—Between Columbus and Indianapolis, Columbus and Chicago, and Logansport and State Line at \$84.00 per day, and 92 cents per 100 lbs. either way between Columbus and Chicago, on excess over 4,000 lbs. daily; and between Columbus and Indianapolis, and Logansport and State line at 1½ times first class freight rates on excess over 4,000 lbs. daily, either way.

Special freight and transportation lines:

The through freight cars of the Pennsylvania route, now owned by the Pennsylvania Company, under the names of Union Line and National Line. They carry the through freight traffic at current rates, and are paid a commission for obtaining and doing the business. Also the Erie and Pacific Despatch, which company own its cars, and bear all expenses forwarding, receiving, and billing freights, except hauling trains, paying therefor rates which are regulated by current traffic. The cars of the above lines are given no preference in any particular.

AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives .....	{ Passenger .....	12	Joint fastenings .....		7
	{ Freight .....	12	Frogs .....		8
Cars .....	{ Passenger .....	12	Ties .....	{ Oak .....	7
	{ Baggage .....	12		{ Cedar .....	
	{ Box .....	14	Bridges .....	{ Wooden .....	12
	{ Stock .....	10		{ Trestles .....	9
	{ Coal .....	8		{ Piling .....	10
Rails .....	{ Flat .....	8	Telegraph poles ...	{ Cedar .....	11
	{ Iron .....	7		{ Other .....	11
	{ Steel .....	12	Fence posts .....		8

RATES OF TRANSPORTATION.

PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles	.04 Cts.	.03 Cts.	} 02.396 Cts.
For distances over 8 miles—First class .....	.03	.02	
Second class .....	.02	.01	
Emigrant .....	.02	.01	
Excursion .....	.02	.01	

Amount charged in addition to regular fares, in sleeping or other cars run on your road: For seat, \$1.00; berth, \$2.00; section, \$4.00; state room, \$4.00. These charges vary according to distances.

FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

First class .....	.0088	.0019	} 00038
Second class .....	.0088	.0014	
Third class .....	.0075	.0011	
Fourth class .....	.0075	.0009	
Fifth class .....	.0063	.0008	
Special class .....	.0038	.0007	

Rate per ton per mile on freight carried less than 30 miles:

First class .....	.1760	.0600	} 00764
Second class .....	.1760	.0600	
Third class .....	.1500	.0600	
Fourth class .....	.1500	.0560	
Fifth class .....	.1260	.0560	
Special class .....	.0760	.0380	

Rate per 100 lbs. for loading or unloading: Included in rate of freight charges.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length—feet.
Scioto .....	Double intersection ...	Iron.....	418
Greenville Creek .....	Girder.....	Iron.....	23½
Greenville Creek .....	Double intersection through Keystone Co.	Iron.....	144
Mill Pond.....	Arch.....	Stone .....	18
Mill Pond (road bridge) .....	Girder.....	Iron.....	21½

Trestles built in Ohio—Length filled and converted into embankment, 932 ft.

Fencing in Ohio—Miles of single fence built, 32.

Rail laid—Steel, 60 pounds per yard, miles of track, 82; in Ohio, 47.

Rolled iron, 60 “ “ 18½.

Train mileage—Passenger .....	1,185,203
Freight.....	4,088,625
Work .....	139,573

Total.....	5,413,401
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Car mileage—Passenger .....	3,306,562
Express and baggage.....	1,860,738
Freight—loaded .....	45,495,006
empty ... ..	12,030,696
Caboose .....	3,021,008
Construction and other. ....	558,292

Total .....	66,272,302
-------------	------------

Fuel consumed—Wood, 10,028½ cords; coal, 174,273½ tons; total cost..... \$442,494 64

Losses, etc., paid—On goods and baggage..... 3,472 89

For injuries in Ohio, fatal and non-fatal—

to passengers.....	\$3,200 00
to employees.....	9,017 90
to others.....	2,148 67

Total .....	14,366 57
-------------	-----------

For animals killed in Ohio:

Horses, 6.....	\$448 85
Mules, 1.....	117 00
Cattle, 14.....	746 10
Sheep, 130.....	268 65
Hogs, 10 .....	70 50

Total.....	1,651 10
------------	----------

Amount claimed in litigation, etc., for injuries in Ohio to persons ..... 27,500 00



## TRANSPORTATION.

Passengers—Number carried, local.....	693,467	
through .....	<u>115,318</u>	
Total.....		808,785
Average number carried in each car per trip .....		12.73
Average number of miles traveled by each .....		51.947
Total mileage, or number carried one mile .....		42,013,686
Average amount received for each .....		\$1 24.473
Average amount <i>per mile</i> received for each .....		02.396 c.
Freight—Tons carried, local .....	1,136,492	
through .....	<u>1,589,371</u>	
Total .....		2,725,863
Average tons in each loaded car per trip.....		10.78
Average tons in each loaded car per mile .....		10.78
Total movement, or tons carried one mile .....		490,551,211
Average amount received for each ton.....		\$1 37.482
Average amount <i>per mile</i> received for each ton .....		.00764 c.
Average cost per ton freight per mile.....		.00686 c.
Average amount received for each ton through freight.....		\$1 26.465
Average amount received for each ton local freight.....		1 52.889
<b>Articles transported :</b>		
	Tons.	Per cent.
Coal and coke.....	558,012	20.5
Stone, lime, sand, etc .....	36,220	1.3
Petroleum .....	10,104	.4
Ores .....	27,337	1.
Pig and bloom iron .....	16,209	.6
Manufactured iron.....	83,988	3.1
Lumber and other forest products .....	227,429	8.3
Grain, flour, and other agricultural products .....	866,981	31.8
Live stock.....	123,278	4.5
Animal products .....	224,418	8.2
Manufactures, including agricultural implements.....	388,273	14.3
Merchandise .....	120,905	4.4
Miscellaneous .....	<u>42,709</u>	<u>1.6</u>
Total tonnage yielding revenue. ....	2,725,863	100
Supplies for company's use .....	235,775	

EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local.....	\$615,461	19	
through.....	391,258	45	
	<hr/>		
Total.....			\$1,006,719 64
Freight transportation—local.....	\$1,737,573	08	
through.....	2,009,999	89	
	<hr/>		
Total.....			\$3,747,572 97

Mail service .....	135,321 43
Express service .....	69,204 21
Other sources.....	54,976 73

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$1,319,591 99
Maintenance of cars .....	291,856 05
Motive power .....	1,166,975 66
Conducting transportation.....	1,386,531 76
General expenses:	
Taxes in Ohio.....	\$30,587 07
Indiana .....	\$59,670 66
Illinois.....	16,787 06
	<hr/>
	\$76,457 72
Salaries .....	28,825 71
Other general expenses of operating .....	79,094 05
	<hr/>
Total .....	\$214,964 55

Total operating expenses, being 87 per cent. of earnings.

Net earnings of 580.5 miles operated.

Rentals paid for use of road, track, depots, equipment, etc.: This road is now operated by this company under orders of United States Circuit Court, and the net earnings paid over to the Receivers.

Net income over operating expenses and rents paid.....	} Should be reported by C., C. & I. C. Railway Company.
Percentage of same to capital stock and debt ..	
Percentage of to total means applied to construction, etc.....	

Per mile of earnings.....	\$8,637 03; proportion for Ohio, 135.9 miles.
operating expenses .....	7,514 07
net earnings.....	1,122 96

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

*P., C. & St. L. Railway Company, operating C., C. & I. C. Railway Company.*

## LIABILITIES.

Stock of supplies received from P., C. & St. L. Railway Company March 31, 1875.....	\$295,598 13
Amount due other companies .....	130,473 16
Amount due for current expenses .....	506,067 28
Balance, being net earnings for 3 months, ending June 30, 1881 .....	108,383 37
	<hr/>
Total.....	\$1,040,521 94

## ASSETS.

Supplies on hand.....	\$303,886 17
Cash on hand .....	209,429 19
Amount due by station agents and conductors.....	130,273 89
Amount due by other companies .....	358,014 39
Miscellaneous assets .....	38,918 30
	<hr/>

Total..... \$1,040,521 94

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880.				
1	July 20	Solomon Spangler.....	Switchman .....	Coupling cars—his own fault .....	First joint of finger taken off.
2	Aug. 21	Henry Taylor.....	" .....	" .....	Hand mashed.
3	Aug. 23	John H. Hecker.....	Unknown .....	Getting off train in motion—his own fault .....	Killed—stealing a ride.
4	26	John Howard .....	Brakeman .....	" .....	Two fingers right hand mashed.
5	25	John Kelley.....	" .....	Coupling cars—his own fault .....	Killed.
6	Sept. 1	James Kelley.....	Tramp .....	Shot by a tramp—beyond his control..	Killed.
7	4	Charles Koehl.....	Brakeman.....	Struck by train while asleep on track..	"
8	2	John English.....	Brakeman.....	Coupling cars—his own fault .....	Two fingers mashed.
9	Oct. 6	Joseph Reagan .....	Stone cutter .....	Asleep on track—his own fault.....	Killed.
10	Nov. 1	M. D. Falkner .....	Unknown .....	Getting off train in motion—his own fault .....	Arm cut off—stealing a ride.
11	4	John McGuire.....	Brakeman.....	Uncoupling cars—his own fault.....	Hip dislocated.
12	7	James E. Scott.....	Laborer .....	Walking on track .....	Killed.
13	12	Charles Law.....	Brakeman .....	Struck by bridge .....	Badly bruised—not serious
14	24	W. H. Norris .....	Drover .....	Knock'd off side car—car did not clear	Cut in cheek and body bruised.
15	Dec. 12	Chester Kenfield .....	Brakeman.....	Coupling cars—his own fault .....	Two fingers crushed.
	1881.			Uncoupling cars .....	Thumb mashed.
16	Jan'y 9	Albert Dice.....	" .....	Coupling cars—his own fault .....	Finger mashed.
17	9	Jacob A. Devine .....	" .....	" .....	
18	Feb'y 12	J. W. Fogle.....	Drover .....	Rear collision—beyond his control .....	Left arm and hip injured.
19	Jan'y 24	Christian Zimmerman..	Fireman .....	Run over—his own fault .....	Right arm cut off.
20	24	Frank Whissou.....	Brakeman .....	Fell from train—want of caution.....	Collar bone broken.
21	29	W. B. Dearduff.....	Conductor.....	Coupling cars—his own fault.....	Hand mashed.
22	Feb'y 12	Martin Sullivan.....	Tramp .....	Jumped from train—his own fault.....	Stealing ride—head and hip bruised.
23	13	John Harper .....	Conductor.....	Struck by pole—want of caution.....	Right foot injured.
24	Mar. 14	Wm. McDole .....	Yardman.....	Attempting to get on train—want of caution.....	
25	18	Wm. M. Pifer.....	Brakeman .....	Coupling cars—his own fault .....	Shoulder dislocated.
26	Feb'y 27	Peter McLaine.....	" .....	" .....	Finger mashed.
					Thumb taken off.



## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Catching foot in frog or between rails—run over .....	1
Miscellaneous .....	1
Others—Getting on or off engine or train in motion .....	1
Lying, walking, falling, or being on track .....	3
	<hr/>
Total.....	6

## PERSONS INJURED—CAUSES.

Passengers Struck by bridge, chute or other obstruction .....	1
Collisions .....	1
Employees—Struck by bridge, chute, or other obstruction.....	2
Coupling, or caught between cars and engine .....	17
Falling or thrown from engine or train .....	4
Run over, catching foot in frog or between rails.....	1
Run over while inspecting ash-pan of engine .....	1
Others—Getting on or off engine or train in motion .....	3
Driving or riding across track.....	3
Coupling, or caught between cars and engine.....	1
	<hr/>
Total.....	34

## RECAPITULATION.

Killed—Employees—from causes beyond their control.....	1
misconduct or want of caution.....	1
Others—stealing rides .....	1
trespassing, on track, etc.....	3
	<hr/>
Total killed .....	6
Injured—Passengers—from causes beyond their control.....	1
misconduct or want of caution.....	1
Employees—from causes beyond their control.....	1
misconduct or want of caution.....	24
Others—at stations and highway crossings.....	3
stealing rides.....	4
	<hr/>
Total injured.....	34

## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880.				
	July 4	Anoka Junction..	Freight .....	Breaking in two.....	Three cars damaged.
	13	Hagenbaugh's....	" .....	Struck hand car.....	Hand car damaged.
	24	D. & M. crossing..	Passenger.....	Struck push car.....	Push car damaged.
	26	Westville .....	Freight .....	Loose wheel.....	Two cars damaged.
	Aug. 8	Wiley's.....	" .....	Collision.....	Caboose destroyed.
	10	Crown Point.....	" .....	Breaking in two.....	" " [track.
	22	Richmond .....	" .....	Collision.....	Engine and 3 cars thrown from
	Sept. 30	Indianapolis .....	Passenger.....	" .....	Two cars damaged.
	Nov. 20	Richmond .....	" .....	Running off switch.....	No damage.
	Dec. 30	Greenville .....	Freight .....	Collision .....	Caboose and engine damaged.
	1881.				
	Jan. 5	Columbus .....	Passenger.....	Broken switch.....	Engine and 2 cars damaged.
	8	Indianapolis .....	Switch .....	Struck wagon on cross'g	No damage to train.
	15	Piqua .....	Freight .....	Collision.....	Caboose damaged.
	2	Indianapolis .....	Switch .....	Struck wagon on cross'g	No damage to train.
	Feb. 10	Urbana .....	Freight .....	Collision on r'y cross'g.	" "
	14	D. & M. crossing..	" .....	Struck wagon on cross'g	" "
	23	Ogden's .....	" .....	Train broke in two.....	Two cars damaged.
	Mar. 3	Kentland .....	Passenger.....	Broken rail.....	No damage to train.
	18	Crown Point.....	Freight .....	Collision.....	Two engines injured.
	19	Ogden's.....	" .....	" .....	Two cars damaged.
	28	Bradford .....	" .....	" .....	Damage light.
	30	Logansport .....	Pass' and frt. ....	" .....	Two engines damaged.
April	1	Ridgeville .....	Freight .....	" .....	One car damaged.
	10	Kokomo .....	" .....	" .....	Engine and car damaged.
	30	Marion .....	Passenger.....	Struck wagon on cross'g	No damage to train.
May	5	Petersville.....	Freight .....	Train broke in two.....	Three cars damaged.
	2	Thompson's.....	" .....	Collision .....	" "

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	4
Accidents not resulting in derailment of train.....	7
Collisions—butting .....	2
crossing .....	3
rear .....	11

Total accidents..... 27

## Causes of accidents effecting derailment of trains:

Broken rail.....	1
Broken wheel.....	1
Malicious obstruction.....	2
Unexplained .....	1

Total..... 5

## Causes of collisions:

Cars blown or run from siding.....	3
Failure of brakes.....	1
Fog .....	3
Runaway engine .....	3
Train breaking in two.....	4
Other causes.....	2

Total ..... 16

Causes of accidents not resulting in derailment of trains .....	6
Total derailment.....	4
Total collisions.....	17
Total accidents .....	27

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*State of Pennsylvania, County of Allegheny, ss.:*

Thos. D. Messler, Third Vice President of the Pittsburgh, Cincinnati and St. Louis Railway Company, operating the Columbus, Chicago and Indiana Central Railway, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

THOS. D. MESSLER,

[SEAL OF R. R.]

*Third Vice President.*

Subscribed and sworn to before me, this 10th day of September, A.D. 1881.

FRANK SEMPLE,

[SEAL.]

*Notary Public.*



COLUMBUS AND HOCKING VALLEY RAILROAD COMPANY

Name of road : The Columbus and Hocking Valley Railroad.  
By whom owned : The Columbus and Hocking Valley Railroad Company.  
By whom operated : The Columbus and Hocking Valley Railroad Company.  
By what authority : Stock.  
Name of company making this report : Columbus and Hocking Valley Railroad Company.  
General office at Columbus, Ohio.  
Principal office in Ohio at Columbus, Ohio.  
Address correspondence relating to this report to T. J. Janney, Auditor C. & H. V. R'y, Columbus, Ohio.

HISTORY OF ORGANIZATION AND CONSTRUCTION.

No change since last report.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
M. M. Greene .....	President.....	Columbus, O.....	
Orland Smith.....	Vice President.....	" .....	
J. J. Janney .....	Secretary and Treasurer...	" .....	
T. J. Janney .....	Auditor.....	" .....	
Orland Smith .....	General Manager.....	" .....	
Geo. R. Carr.....	General Superintendent...	" .....	
W. H. Jennings .....	Chief Engineer.....	" .....	
W. H. Harrison.....	Gen'l Pas'er & Ticket Agt..	" .....	
W. A. Mills.....	General Freight Agent....	" .....	
M. M. Greene .....	Executive Committee..	" .....	
Wm. G. Deshler .....		" .....	
P. W. Huntington .....		" .....	
Isaac Eberly .....		" .....	
Henry C. Noble .....		" .....	
Total salaries.....			\$20,900

DIRECTORS.

Name.	Residence.	Name.	Residence.
M. M. Greene .....	Columbus .....	W. B. Hawkes .....	Columbus.
Wm. G. Deshler.....	" .....	H. W. Jaeger.....	" .....
Henry C. Noble.....	" .....	Orland Smith .....	" .....
B. S. Brown .....	" .....	Jno. D. Martin .....	Lancaster.
P. W. Huntington .....	" .....	C. H. Rippey .....	Logan.
Wm. Dennison.....	" .....	S. W. Pickering .....	Athens.
Isaac Eberly .....	" .....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$2,500,000 00
Number of shares—common.....	50,000
Par value of each—common.....	\$50 00
Capital stock authorized by vote of company—common .....	2,500,000 00
Amount subscribed—common.....	2,500,000 00
Total paid in capital stock—common.....	2,500,000 00
Increase since June 30, 1880—common.....	323,450 00
Average amount paid in per mile of single main track (112 miles).....	22,321 43
Proportion of same for Ohio (11.2 miles).....	22,321 43

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.	Amount of preferred.
For subscriptions paid in cash .....	40,550	\$2,027,500	None.
For construction on extension of line or branches .....	672	33,600	"
In payment of dividends.....	8,778	438,900	"
Total.....	50,000	\$2,500,000	None.

Stockholders, residents of Ohio, 416.

Amount of stock held by them June 30, 1881, \$2,266,950.

Agents authorized to transfer stock: Have no agents for the transfer of stock. All transfers made at principal office of the company.

## FUNDED DEBT.

1. Kind of bond or obli- gations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of in- terest.	6. Amount of author- ized issue.	7. Amount actually issued.
First mortgage	Sink'g fund bond	Oct., 1867	Oct., 1897	7	\$1,500,000	\$1,500,000
Second "	"	Jan., 1872	Jan., 1892	7	1,000,000	1,000,000
Total .....					\$2,500,000	\$2,500,000

Average amount per mile of single main track (112 miles) ..... \$22,321 43

Proportion of same for Ohio (11.2 miles)..... 22,321 43

Amount in hands of trustees of sinking fund for redemption..... 25,350 00

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$19,960 00	
All other debts, current credit balances, etc.....	110,558 96	
Total unfunded debt .....	130,518 96	
Cash securities, debit balances, etc., available to payment.....	197,433 76	
Excess of assets over unfunded debt.....	\$66,914 80	
Total net debt liabilities .....		\$2,500,000
Average amount per mile of single main track.....	\$22,321 43	
Proportion of same for Ohio.....	All	
Total of paid in stock and debt.....		5,000,000
Total average amount per mile..	\$44,642 86	
Proportion of same for Ohio.....	All	

## COST OF ROAD EQUIPMENT, ETC.

Construction account.	Total expenditures to July 1, 1881.
Right of way .....	\$125,520 03
Civil engineering, salaries, etc .....	100,072 95
Grading and masonry .....	3,013.731 05
Bridges, steel rails .....	
Timber and ties.....	
Superstructure.....	
Iron rails, chairs and spikes .....	
Fencing .....	35,140 82
Passenger and freight stations.....	33,600 60
Engine and car houses .....	68,565 50
Machine shops, machinery and fixtures.....	82,144 63
Other buildings and fixtures .....	2,500 00
Telegraph .....	4,862 85
Interest and discount .....	315,615 72
Steam Excavator.....	9,079 37
Total expenditures for construction.....	\$3,790,893 52

Average cost per mile of road constructed (single main track, 112 miles) .....	\$33,847 26
Average cost per mile of road owned by company (single main track, 112 miles).....	33,847 26
Proportion of same for Ohio (112 miles), all.	

## ANNUAL REPORT.

## COST OF EQUIPMENT OWNED BY COMPANY.

46 locomotives .....	\$507,501 95
12 first-class passenger cars.....	56,280 55
2 second class passenger cars, combination cars .....	7,515 97
100 box freight cars.....	52,450 00
2210 platform cars, principally coal cars.....	1,024,750 50
4 baggage cars.....	9,930 00
21 caboose cars.....	15,600 00
1 directors and superintendent's car, owned jointly with C. & T. R'y	2,250 00
1 pay car, owned jointly with C. & T. Railway.....	2,275 00
2 wrecking cars .....	1,225 00

Total cost of railroad equipment owned by company.....	\$1,679,778 97
Additions within the year ending June 30, 1881.....	344,718 20
Average amount per mile (of single main track, 112 miles) .....	14,998 02
Proportion for Ohio (112 miles), all.	

Total for road and equipment .....	5,470,672 49
Total average amount per mile (of single main track, 112 miles) .....	48,845 28
Proportion of same for Ohio (112 miles), all.	

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—Columbus to Athens.....	75.62 miles.	All.
Logan to Straitsville.....	12.39 “	“
Nelsonville to Junction Straitsville Branch, and to Obirton .....	20.44 “	“
Total single main track.....	108.45 “	“
Aggregate of sidings and other tracks.....	45.36 “	“

Total length laid with rail computed as single track.....	153.81 “
Length laid with steel rail.....	104.84 “
Length in Ohio, distributed as follows:	

County.	Main track.	Branches.	Sidings, etc.	Total.
Franklin.....	15.87	.....	12.40	28.27
Fairfield.....	23.53	.....	5.62	29.15
Hocking.....	19.27	23.82	14.31	57.40
Athens.....	16.95	7.12	8.37	32.44
Perry.....	1.89	1.89	6.66	6 55
Totals.....	75.62	32.83	45.36	153.81
Steel rail.....	75.62	29.22	.....	104.84

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	57 inches.
Grade—Maximum, per mile.....	26.4 feet.
Longest maximum.....	5,000 "
Aggregate length of maximum.....	12,000 "
Curvature—Shortest radius on branch.....	717 "
Aggregate length of shortest radius.....	431 "
Aggregate length of all curves.....	39.31 miles.
Aggregate length of tangent .....	69.14 "
Rail—Iron—On road.....	97.94 "
Average weight per yard.....	56 lbs.
Steel—On road .....	209.68 miles.
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	3,000
Number laid during the year, about.....	70,000
Ballasted—On whole line.....	153.81 miles.
In Ohio.....	All.
With gravel, stone and cinders.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—29; greatest age, $13\frac{5}{12}$ years; aggregate length .....	3,262 ft.
Iron—7; greatest age, $7\frac{8}{12}$ years; aggregate length .....	803 "
Combination—4; greatest age, $8\frac{6}{12}$ ; aggregate length.....	400 "
Total .....	4,465 ft.
Trestles—36; greatest age, 9 years; greatest height, 15 feet; greatest length, 333 feet; aggregate length, 2,985 feet.	
Length of shortest span of truss, $24\frac{1}{2}$ feet; of longest, 181 feet; greatest length of beams between points of support, if not trussed, 13 feet.	
Greatest space between cross ties upon bridges and trestles, 16 inches; length of ties, 10 to 14 feet.	
Number of track stringers, 2 and 4.	
Are all bridges and trestles provided with guard rails? Yes.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Once a month.	
Are the examinations analytical, and are they made by a competent person? Analytical, about twice a year.	

## Fencing—Average and Aggregate Cost.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	188	All.
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.25).....	176	
Wire (average cost per rod, \$1.00).....	10	
Hedge.....	2	
Average cost of fencing, about \$1.25.	.	
Average cost of same per rod, about \$1.25.		
Length of road unfenced, and the reason therefor, about.....	13	
Through towns, etc., not requiring fence.		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

L. M. Division, P., C. & St. L. Railway, at Columbus, Ohio.

C. & M. V. Division, P., C. & St. L. Railroad, at Lancaster, Ohio.

Scioto Valley Railway, at 7 miles east of Columbus.

Number of crossings of highways at grade in this State without protection, 82.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 3.

Number of crossings of highways over railroad, 1.

“ “ “ under railroad, 1.

Highway bridges 18 feet above track, 1.

Do all trains stop at R. R. crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated ..... 108½; in Ohio, all.

Miles of same owned by railroad company, jointly..... 108½; “ “

## STATIONS.

Passenger and freight..... 28; in Ohio, all.

Number with telegraph communication..... 25; “ “

Number of same operated by railroad company..... 25; “ “

Is pay received for messages sent over line owned by railroad company? Telegraph

Company charges for commercial messages.

## ROLLING STOCK.

Locomotives ..... 46; Average weight..... 110,000 lbs.

Express and baggage cars..... 4; “ ..... 33,000 “

Passenger cars ..... 16; “ ..... 46,190 “

Freight cars..... 3,011.

Other cars ..... 23.

Above includes not owned by company reporting.

Freight cars—701, owned by coal operators and miners (100 of these are four-wheel dump cars).

Terms of service: Three-fourths of one cent per mile mileage, loaded or empty.

Number of locomotives equipped with train brakes, 10.

Kind of brake: Westinghouse Air Brake, automatic.

Number of cars equipped with train brakes, 16.

Kind: Westinghouse Air Brake, automatic.

Number of passenger cars with “Miller Platform,” 16.

Method of bridging between passenger cars, when two or more are run in trains:

“Miller Platform.”

Are all cars run on this road heated and lighted as prescribed by law? Yes, so far as is practicable.

State methods of heating cars used for the transportation of passengers: Patent car stove.

Means of lighting same: Candles and lamps.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	22 miles per hour.
Mail and accommodation.....	22 "
Freight trains.....	12 "

## EMPLOYEES.

Superintendents.....	2
Telegraph operators.....	23
Engineers.....	45
Baggagemen.....	5
Flagmen, switch-tenders and watchmen.....	13
Laborers.....	99
Clerks.....	79
Train dispatchers.....	2
Firemen.....	50
Wipers.....	49
Mechanics.....	263
Conductors.....	46
Brakemen.....	93
Station agents.....	28
Section men.....	212
Other employes.....	61

Total number employed by Company in operating line.....	1,070
Proportion for Ohio.....	All.

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams Express Company.

Terms: From 16 to 32 cents per 100 lbs.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in Years.	Equipment and superstructure.		Average life in years.
Locomotives	Passenger.....	*	Frogs.....		10
	Freight.....	*	Ties—Oak.....		7
Cars.....	Passenger.....	*	Bridges.....	W'd'n—In use 13½ yrs.....	*
	Baggage.....	*		Iron—In use 7½ yrs.....	*
	Box.....	8 to 10		Combination—In use.....	
	Stock.....	"		8½ years.....	*
	Coal.....	"		Trestles—In use 9 yrs.....	*
Rails.....	Flat.....	"	Telegraph poles	Piling.....	
	Iron—About 5 years on tracks most in use.....	*		Cedar.....	15
	Steel in use now 10 years.....	*	Fence posts.....	Other.....	10
Joint Fastenings.....		*			10

\*None of these have been worn out since the road was built.



## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile :			
For distances less than 8 miles...	.07½ Cts.	.03¼ Cts.	About .05 Cts.
For distances over 8 mi.—1st class	.03	.02½	" .02¼
Excursion	.02½	.01	.01¾

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Average.	Highest.	Lowest.
First class.....	.01	.00243	
Second class.....	.01	.0023	
Third class.....	.01	.002	
Fourth class.....	.01	.00166	
Fifth class .....	.0055	.00115	
Special class.....	.0057	.0009	

Rate per ton per mile on freight carried less than 30 miles :

First class.....	.05	.05	.05
Second class.....	.05	.05	.05
Third class.....	.05	.05	.05
Fourth class.....	.05	.945	
Fifth class.....	.045	.04	
Special class .....	.04	.02	

Rate per ton per mile on freight carried more than 30 miles:

First class.....	.05	.05	.05
Second class.....	.0475	.046	
Third class.....	.045	.041	
Fourth class.....	.0435	.032	
Fifth class.....	.04	.023	
Special class.....	.03	.012	

Rate per ton per mile for—

Coal—Carried 10 miles or more.....	.05	.01	
Carried less than 10 miles.....	.05	.04	
Pig iron—Carried 10 miles or more.....	.05	.012	
Carried less than 10 miles.....	.05	.05	.05
Limestone—Carried ten miles or more.....	.05	.01	
Carried less than ten miles.....	.05	.045	
Iron Ore—Carried ten miles or more.....	.05	.012	
Carried less than ten miles.....	.05	.045	
Undressed stone or lumber—Carried 10 miles or more...	.05	.011	
Carried less than 10 miles...	.05	.05	.05

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length.
Little Monday.....	Howe Truss.....	Wood.....	86 feet.
Pelton.....	".....	".....	86 "
Payne's.....	".....	".....	86 "
Lehman's.....	".....	".....	106 "

Trestles—filled and converted into embankment.....	53 feet.
Fencing in Ohio—Miles of single fence built (average cost per rod, \$1.00)..<	9 miles.
Grading—Miles of main track graded.....	438; in Ohio, All.
Ballasting—Miles of main track ballasted.....	438; " "
Rail laid—Steel, 60 lbs. per yard—miles of track.....	11.22; " "
New iron, 56 lbs. per yard—miles of track.....	750; " "
Train Mileage—Passenger ..	153,376
Freight .....	659,571
Mixed .....	60,442
Construction .....	6,895
Total.....	880,284
Car Mileage—Passenger .....	391,673
Express and baggage .....	140,875
Freight—loaded.....	7,803,094
empty .....	5,202,062
Caboose .....	512,729
Construction and other.....	41,170
Total.....	14,091,603
Fuel consumed—Wood, 1,285 cords; coal, 25,597½ tons. Total cost.....	\$32,244 62
Losses, etc., paid—On goods and baggage.....	281 82
For injuries in Ohio, fatal and non-fatal:	
to employes.....	1,166 65
to others.....	295 00
Total .....	\$1,461 65
For animals killed in Ohio: 5 horses .....	\$313 00
1 mule .....	50 00
10 cattle .....	162 00
101 sheep.....	336 50
1 hog.....	5 00
Total.....	\$896 50

Amount claimed in litigation, etc., for injuries in Ohio to persons, unknown.

Passengers—Number carried, local .....	239,738
through.....	2,530
Total.....	242,275
Average number carried in each car per trip, about.....	35
Average number of miles traveled by each.....	23.92
Total mileage, or number carried one mile.....	5,795,490
Average amount received for each.....	48.9 cts.
Average amount <i>per mile</i> received for each .....	2.04 cts.
Freight—Tons carried, local.....	1,607,882
through.....	10,005
Total .....	1,617,887
Average tons in each loaded car per trip, about.....	12.85
Average tons in each loaded car per mile, about.....	12.00
Total movement, or tons carried one mile.....	92,660,635
Average amount received for each ton.....	64.39 cts.
Average amount <i>per mile</i> received for each ton .....	1.12 cts.
Average amount received for each ton through freight.....	1 $\frac{1}{10}$ cts.
Average amount received for each ton local freight.....	64.08 cts.
<b>Articles transported:</b>	
	Tons.      Per cent.
Coal .....	1,282,336      79.3
Stone, lime, sand, etc.,.....	57,082      03.5
Iron ores .....	85,320      05.3
Pig iron.....	68,524      04.2
Lumber and other forest products.....	26,560      01.6
Grain, flour, and other agricultural products .....	23,332      01.4
Live stock.....	1,768      00.1
Salt.....	2,758      00.2
Miscellaneous ..	70,207      04.4
Total tonnage yielding revenue.....	1,617,887      100
Supplies for company's use, about.....	40,000
<b>EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.</b>	
<b>EARNINGS.</b>	
Passenger transportation—local.....	\$113,158 82
through.....	5,398 74
Total.....	\$118,557 56
Freight transportation—local .....	\$1,030,392 85
through.....	11,455 00
Total.....	\$1,041,847 85
Mail service.....	4,803 70
Express service.....	6,003 22
Other sources.....	15,385 78
Total earnings of line operated included in this report.....	\$1,186,598 11

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$131,636 89	
Maintenance of cars .....	161,253 81	
Motive power .....	201,362 93	
Conducting transportation .....	164,498 41	
General expenses, as follows:		
Taxes in Ohio .....	\$23,968 17	
Salaries .....	37,498 30	
Other general expenses of operating .....	4,853 83	
	<u>          </u>	\$66,320 30
Total operating expenses, being $61\frac{32}{100}$ % of earnings.....		\$725,072 34
Net earnings of 112 miles operated.....		461,525 77
Rentals paid for use of road, track, depots, equipment, etc.:		
C. C. & I. C. R'y Co.....	2,628 80	
	<u>          </u>	2,628 80
Net income over operating expenses and rents paid.....		\$458,896 97
Percentage of same to capital stock and debt, 09.17.		
Percentage of to total means applied to construction, etc., 08.39.		
Per mile of earnings.....		\$10,594 62
operating expenses .....		6,473 87
net earnings.....		4,120 75

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock.....	\$323,450 00	
Increase of floating debt.....	16,138 32	
" net assets over unfunded debt.....	32,464 77	
Premium on stock sold .....	45,681 00	
	<u>          </u>	\$417,734 09

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$175,000 00	
Interest on floating debt .....	246 85	
Dividends.....	185,062 00	
Last dividend declared on general stock: Feb. 10, 1881.		
Applied to sinking fund.....	49,800 00	
Construction of new work .....	70,712 98	
Additional equipment .....	344,718 20	
Additional real estate .....	24,497 36	
	<u>          </u>	\$850,037 39

## CONDENSED GENERAL BALANCE SHEET JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$2,500,000 00
Bonds issued (30 years, 7 %, 1st mortgage).....	1,500,000 00
"    (20 years, 7 %, 2d mortgage).....	1,000,000 00
Bills payable .....	19,960 00
Due agents .....	2,236 74
Due connecting roads.....	3,943 91
Due on other accounts.....	69,447 72
Coupons outstanding.....	34,548 59
Dividends unpaid.....	382 00
Contingent account.....	859,130 80
Total.....	\$5,989,649 76

## ASSETS.

Cash on hand.....	\$68,043 51
Construction—Main line .....	2,867,124 64
"    Straitsville Branch .....	251,677 50
"    M. C. & S. F. Branch.....	267,750 00
Equipment .....	1,679,778 97
Steam excavator.....	9,079 37
Real estate (shop, switch and depot grounds).....	196,351 56
Shop tools and machinery.....	33,386 75
Fencing.....	35,140 82
Right of way (part fencing included).....	125,520 03
Bills receivable .....	2,478 75
Supplies and material.....	92,961 74
Due from agents.....	7,792 61
Due from connecting roads.....	80,275 48
Due from other accounts.....	13,925 18
Sinking fund .....	253,500 00
Telegraph line.....	4,862 85
Total.....	\$5,989,649 76

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1880					
1	July 5	John Hall...	Coal miner...	Intoxicated; trespassing on track.....	Killed.
2	July 24	E. Hampson...	Brakeman...	At Carroll; his own fault.....	Leg broken.
3	Aug. 8	— Reed...	Unknown...	Man intoxicated at Col. High St. cross'g	Killed.
4	Sept. 9	H. Mender...	Brakeman...	Switching cars in yard.....	Leg and hip inj' red.
5	13	F. Kniefer...	"	Pinched while making coupling.....	Lost one finger.
6	Oct 23	— Whitman...	Coal miner...	Intoxicated; trespassing on track.....	Killed.
7	29	— Butler.....	Unknown...	Boy stealing ride; fell off.....	"
8	Nov. 26	Jos. Lowry...	Coal miner...	Partially blind; trespassing on track...	"
9	Dec. 10	Wm. Seoby...	Unknown...	Passenger jumped from train in motion	He recovered.
1881					
10	Apr. 12	Fred. Reeder	Brakeman...	Car pinched his foot.....	"
11	26	Sam. Bland...	"	Foot caught on guard rail and crushed	Killed.
12	June 24	Jno. Phillips	Boy.....	Run over by cars.....	He recovered.

## SUMMARY OF ACCIDENTS.

Persons killed—Causes.	Passengers.	Employees.	Others.	Totals.
Falling or thrown from engine or train.....	.....	.....	1	1
Lying, walking, falling, or being on track.....	.....	.....	4	4
Catching foot in frog or between rails—run over .....	.....	1	.....	1
Totals.....	.....	1	5	6

Persons injured—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....	1	.....	.....	1
Coupling, or caught between cars and engine.....	.....	1	.....	1
Lying, walking, falling, or being on track.....	.....	.....	1	1
Run over in yards, on siding or switching .....	.....	3	.....	3
Totals.....	10	4	1	6

## RECAPITULATION.

Killed—Employees—misconduct or want of caution.....	1
Others—stealing rides.....	1
trespassing on track, etc.....	4
Total killed.....	6
Injured—Passengers—misconduct or want of caution.....	1
Employees—misconduct or want of caution.....	4
Others—trespassing on track, etc .....	1
Total injured.....	6

*State of Ohio, County of Franklin, ss.:*

M. M. Greene, President of the Columbus & Hocking Valley Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

Subscribed and sworn to before me this 11th day of October, A. D., 1881.

[SEAL.]

M. M. GREENE, *President.*

F. H. MEDARY,

*Notary Public of Franklin County, Ohio.*

## COLUMBUS AND MAYSVILLE RAILWAY COMPANY.

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Name of road : Columbus and Maysville Railway, Southern Division.

By who owned : Columbus and Maysville Railway Company.

By whom operated : Cincinnati and Eastern Railway Company.

By what authority : Lease (temporary).

Name of company making this report : Columbus and Maysville R. R. Co.

General office at Hillsboro, Highland county, Ohio.

Principal office in Ohio at Hillsboro.

Address correspondence relating to this report to Thomas Hibben, Secretary, at Hillsboro, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Incorporated April 27, 1877, under the name of the Columbus and Maysville Railway Company, Southern Division (narrow guage); capital stock, \$350,000. Terminal points—North, Washington C. H.; South, Ripley. Authority to construct a branch from, at, or near Hillsboro, Ohio, to Bainbridge, in Ross county, a point of intersection with the Springfield Southern Railroad. The part in operation is named "Southern Division" in contradistinction to Northern Division of road from Washington C. H. to Columbus, Ohio.

First organization to elect a Board of Directors, August 20, 1877.

Board elected—C. S. Bell, Benjamin Barrere, Joseph H. Richards, John H. Jolly and John W. Kibler, of Highland county; Chambers Baird and Andrew King, of Brown county. C. S. Bell was elected President, H. M. Higgins, Secretary, Benjamin Barrere, Treasurer, and F. J. Picard, Chief Engineer. H. M. Higgins resigned October 30, 1877, and Thomas Hibben was appointed to fill vacancy. Benjamin Barrere resigned as Treasurer November 23, 1877, and E. L. Ferris filled the vacancy. Commenced work of construction in November, 1877, and completed to junction with M. & C. R. R., one mile west of Hillsboro, January, 1879. At annual election, May 28, 1878, the number of Directors was increased to thirteen.

On July 9, 1878, bonds were authorized to be issued to the amount of \$350,000, of which sum \$70,000 first mortgage bonds were directed by the Board to be issued to secure indebtedness for the purchase of iron. By authority given to Trustees appointed by council of the incorporated village of Hillsboro, under a law granting them power to levy a tax for



completion of the road from junction with M. & C. Road to the town, the track was laid into town and road completed November, 1879, under an organization known as the Hillsboro Short Line Railway Company.

By consent of stockholders and action of Board of Directors, charter was amended to extend the road from Washington C. H. to Columbus, and from Ripley to Aberdeen, on August 5, 1880.

On August 12, 1880, the capital stock was increased \$2,650,000, making the total capital stock \$3,000,000.

At October term of court, 1880, the name of the company was changed to Columbus and Maysville Railroad Company. By amendment April 21, 1881, the course of the line was changed, to-wit: running to Columbus via Mt. Sterling, Jeffersonville, Sabina, Hillsboro, Russellville, to Aberdeen, instead of via Washington C. H., Hillsboro and Ripley. No part of the extension yet constructed or contracted. Rights-of-way obtained for almost the entire line, and a subscription of \$500,000.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
C. S. Bell.....	President.....	Hillsboro.....	None.
Thomas Hibben.....	Secretary.....	.....	\$2,500
E. L. Ferris.....	Treasurer.....	.....	2,500
Thomas Hibben.....	Auditor.....	.....	2,500
Stephen Feike.....	Manager (narrow g. div.)..	Sardinia.....	2,500
F. J. Picard.....	General Superintendent...	Hillsboro.....	2,500
".....	Chief Engineer.....	".....	2,500
C. S. Bell.....	Executive Committee.	".....	.....
W. R. Smith.....		".....	.....
Dan. F. Scott.....		".....	.....
Joseph H. Richards.....		".....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
C. S. Bell.....	Hillsboro, O.....	F. J. Picard.....	Hillsboro, O.
D. F. Scott.....	".....	R. I. Hough.....	".....
W. R. Smith.....	".....	John H. Jolly.....	".....
Joseph H. Richards.....	".....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$350,000 00
Number of shares—common.....	7,000
Par value of each—common.....	\$50 00
Increase since June 30, 1831—common.....	2,650,000 00
Capital stock authorized by vote of Company—common.....	60,400 00
Amount subscribed—common.....	66,950 00
Total paid in capital stock—common.....	60,400 00
Average amount paid in per mile of single main track (18.7 miles).....	\$3,230 00

Capital stock issued, and on what account, as follows:

For subscriptions paid in cash—No. shares, 1,208.

Stockholders, residents of Ohio, 414.

Amount of stock held by them June 30, 1881, \$60,400.00.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage..	Road, etc.....	Jan. 1, 1879...	Jan. 1, 1899	7%	\$70,000	\$61,400

Average amount per mile of single main track (18.7 miles), \$3,283.42.

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate .....	\$6,721 72
All other debts, current credit balances, etc .....	4,151 00
Total unfunded debt.....	10,872 72
Cash securities, debit balances, etc., available to payment (un- collected stock value).....	1,987 64
Net unfunded debt.....	\$8,885 08
Average amount per mile of single main track.....	\$475 13
Increase since June 30, 1880 .....	4,151 30
Total of paid in stock and debt.....	130,685 08
Total average amount per mile.....	6,988 50

## COST OF ROAD EQUIPMENT, ETC.

Construction account.	Expenditures prior to July 1, 1880.
Real estate .....	\$210 00
Right of way .....	789 00
Civil engineering.....	5,330 21
Grading and masonry.....	17,118 15
Bridges.....	1,947 00
Timber and ties .....	9,940 01
Superstructure.....	6,354 97
Iron rails, chairs and spikes.....	44,391 71
Fencing and cattle guards.....	417 81
Other buildings and fixtures.....	251 34
Contingent expenses .....	1,524 62
Tools.....	570 18
Ballast.....	3,854 85
Total expenditures for construction.....	\$92,599 85

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 1.....	\$5,040 00
Box freight cars, 1.....	303 47
Platform cars, 5.....	1,199 85
Mail and express cars and combination .....	1,200 00
Hand cars, 1 .....	37 25
Track laying cars, 1 .....	52 25
All other rolling stock, tools, machinery, etc.....	706 00
Total cost of railroad equipment owned by company.....	10,083 82
Average amount per mile (of single main track, 18.7 miles) .....	539 50

## OTHER ITEMS CHARGED TO PERMANENT INVESTMENT.

Office and station supplies.....	\$177 00
Total permanent investment.....	10,265 82
Average per mile (of single main track, 18.7 miles).....	548 98

## CHARACTERISTICS, ETC.

## PROPOSED LINES.

From Hillsboro to Columbus, 74.5 miles.

From Sardinia to Maysville, 26.4 miles.

Proposed gauge, 4 feet 8½ inches.

## LINE IN OPERATION.

## Narrow Gauge Division.

	Length.
Single main track, Hillsboro to Sardinia .....	18.7
Total single main track .....	18.7
Aggregate of sidings and other tracks .....	1

Total length laid with rail computed as single track ..... 19.7

Laid with 35-pound iron rail.

Length in Ohio, distributed as follows :

County.	Main track.	Sidings, etc.
Highland .....	17.10	.7
Brown .....	1.60	.3
Totals .....	18.70	1.00

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.
Hillsboro Short Line Railway, from M. & C. Junction to Hillsboro .....	1.30

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

## Narrow Gauge Division, Hillsboro to Sardinia.

Gauge .....	3 feet.
Grade—Maximum, per mile .....	79 "
Longest maximum .....	2,000 "
Aggregate length of maximum .....	15,000 "
Curvature—Shortest radius .....	716 "
Aggregate length of shortest radius .....	3,840 "
Aggregate length of all radii .....	12,000 "
Aggregate length of tangent .....	15.70 miles.
Rail—Iron—Average weight per yard .....	35 lbs.
Ties—Average number per mile .....	2,865
Ballasted—On whole line—Very little line ballasted, as the grade is to be changed in converting road-bed from narrow to standard gauge.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—Greatest age, 3 years; aggregate length, 118 feet.
Trestles—15; greatest age, 3 years; greatest height, 30 feet; greatest length, 300 feet.
Length of shortest span of truss, 12 feet; of longest, 16 feet.
Greatest space between cross ties upon bridges and trestles, 12 inches; length of ties, 6 feet.
Number of track-stringers, 4.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Daily.

Are the examinations analytical, and are they made by a competent person? Section foreman.

## FENCING.

Fenced by landowners along the greater part of line.

CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Marietta & Cincinnati Railroad, near Hillsboro,  $1\frac{1}{2}$  miles west.

Do all trains stop at railroad crossings as required by law? Yes.

## STATIONS AND TELEGRAPH.

STATIONS.

Passenger and freight .....	6
-----------------------------	---

Number with telegraph communication .....None.

## ROLLING STOCK.

Furnished by Cincinnati Eastern.

## TRANSPORTATION.

From July 10, 1880, to November 1, 1880.

Passengers—Number carried, local.....	1,804
through .....	18

Total .....	1,822
-------------	-------

Average number carried in each car per trip..... 10

Average number of miles traveled by each..... 19

Average amount received for each..... 42c

Average amount per mile received for each..... 21c.

Freight—Tons carried, local.....	175
----------------------------------	-----

through..... 159

Total.....	334
------------	-----

Average amount received for each ton.....	\$1 30
---	--------

Average amount received for each ton through freight.....	91
---	----

Average amount received for each ton local freight.....	1 75
---	------

Articles transported:

Tons.

Lumber and other forest products.....	42
---------------------------------------	----

Manufactures, including agricultural implements.....	15
--	----

Merchandise .....	118
-------------------	-----

Total tonnage yielding revenue.....	175
-------------------------------------	-----

EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30TH.

### EARNINGS.

Passenger transportation—local .....	\$288	77
through .....	8	50
Total.....		\$297 27
Freight transportation—local.....	\$636	75
through .....	3	15
Total .....		\$639 90
Mail service.....		339 09
Express service .....		68 92
Total earnings of line operated included in this report.....		\$1,345 18

OPERATING EXPENSES.

Maintenance of way and structures.....	\$211 75	
Maintenance of cars .....	99 82	
Motive power .....	583 03	
Conducting transportation .....	64 70	
General expenses, as follows:		
Taxes in Ohio .....	104 97	
Salaries .....	770 00	
Other general expenses of operating.....	43 80	
Total operating expenses.....		\$1,878 07

CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

LIABILITIES.

Capital stock paid .....	\$60,400 00
Loan, first series .....	24,350 00
Loan, second series.....	4,000 00
B. P. construction account .....	2,915 28
Account current.....	579 36
Interest on loan .....	5,832 00
Interest on construction account .....	409 35
Salaries.....	1,500 00
	<hr/>
	\$97,485 99

## ASSETS.

Track and road bed.....	\$92,036 29	
Engineer's instruments .....	400 00	
Office furniture .....	100 00	
Station supplies .....	77 00	
Real estate.....	275 00	
Account current .....	2,384 91	
Uncollected stock, value.....	1,987 64	
	<hr/>	\$97,485 99

*State of Ohio, County of Highland, ss.:*

F. J. Picard, Superintendent of the Columbus and Maysville Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

F. J. PICARD,

*Sup't Col. & Maysville R. R. Co.*

Subscribed and sworn to before me, this 4th day of November, A. D. 1881.

A. HARMAN,

*Notary Public.*

[SEAL.]



# COLUMBUS, SPRINGFIELD AND CINCINNATI RAILROAD COMPANY.

Name of road: Columbus, Springfield and Cincinnati Railroad.

By whom owned: Columbus, Springfield and Cincinnati Railroad Company.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. S. Farlow .....	President .....	Boston .....	.....
I. D. Farnsworth .....	Vice President.....	" .....	.....
J. L. Moore .....	Secretary and Treasurer...	Sandusky .....	\$400
J. S. Farlow .....	} Executive Committee.. {	.....	.....
I. D. Farnsworth .....		.....	.....
N. W. Pierce .....		.....	.....
J. L. Moore .....		.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
J. S. Farlow.....	Boston, Mass.....	J. L. Moore.....	Sandusky.
I. D. Farnsworth .....	" .....	J. H. Thomas.....	Springfield.
N. W. Pierce .....	" .....	J. A. Jeffrey.....	Columbus.
J. D. Chamberlin.....	Sandusky .....		

## CAPITAL STOCK.

### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$1,000,000 00	
Number of shares—common .....	2,000	
Par value of each—common.....		\$50 00

### CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$1,000,000 00
Amount subscribed—common .....	1,000,000 00
Total paid in capital stock—common .....	1,000,000 00
Increase since June 30, 1880—common.....	22,537 75
Average amount paid in per mile of single main track (44.37 miles).	

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.
For original construction, London to Springfield.....	5,000	\$250,000
For construction on extension of line or branches—London and Columbus.....	15,000	750,000
Total.....		\$1,000,000

Stockholders, residents of Ohio, 4.

Amount of stock held by them June 30, 1881, \$6,050.

Agents authorized to transfer stock: J. L. Moore, Treasurer, Sandusky.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.	7 per cent. bonds, mortgage on entire line (f road.....	Sept. 1, 1871	Sept. 1, 1901	7	\$1,000,000 00	\$1,000,000 00
Total.....						\$1,000,000 00

Average amount per mile of single main track (44.37 miles) ..... } \$22,537 75  
 Proportion of same for Ohio.....

Amount in hand of trustees of sinking fund for redemption: Nothing.

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$149,186 67	
Total unfunded debt.....	149,186 67	
Cash securities, debit balances, etc., available to payment	58,944 58	
Net unfunded debt .....		\$90,242 09
Average amount per mile of single main track.....	\$2,033 85	
Increase since June 30, 1880.....	5,586 67	
Total net debt liabilities .....		1,090,242 09
Average amount per mile of single main track.....		24,571 60
Proportion of same for Ohio.....		2,149,186 67
Total of paid in stock and debt—gross debt.....		2,090,242 09
Total average amount per mile .....		48,437 83
Proportion of same for Ohio—net debt.....		47,109 35

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expendi- tures for the year ending June 30, 1881.	Total ex- penditures to July 1, 1881.
Real estate, etc., since completion of road...	\$31,064 43	\$5,550 60	\$36,615 03
Total cost of road under contract, in bonds and stock.....	2,000,000 00	.....	2,000,000 00
Total expenditures for construction...	\$2,031,064 43	\$5,550 60	\$2,036,615 03

This company does not own any equipment.

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Columbus to Springfield.....	44.37	44.37
Total single main track.....	44.37	44.37
Aggregate of sidings and other tracks .....	2.25	2.25
Total length laid with rail computed as single track .....	46.62	46.62
Laid with steel rail: About 19 miles.		
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Clarke .....	14.50	.25	14.75
Madison.....	15.06	.50	15.56
Franklin .....	14.81	1.50	16.31
Totals.....	44.37	2.25	46.62

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge ..... 4 feet 8½ in.

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Rental of real estate .....	\$144 00	
Increase of floating debt.....	5,586 67	
Interest .....	10 49	
Cin., San. & Cleve. R. R. Co., rental 10 months to Apr. 30, 1881	66,666 67	
I., B. & W. R'y Co., rental for May and June, 1881, on basis of minimum guarantee .....	13,333 34	
		\$85,741 17

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$70,000 00	
Construction of new work.....	5,550 60	
Salary account.....	350 00	
Taxes and repairs on real estate in Columbus .....	35 40	
Increase of floating assets .....	9,805 17	
	<hr/>	\$85,741 17

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

First mortgage bonds .....	\$1,000,000 00	
Capital stock .....	\$1,000,000 00	
Individual account .....	16 67	
Unpaid coupons .....	149,170 60	
	<hr/>	\$2,149,186 67

## ASSETS.

Railway .....	\$2,000,000 00	
Real estate, etc. ....	36,615 03	
Cin., San. & Cleveland R. R. Co. rental account.....	1,145 84	
Profit and loss.....	53,627 06	
Coupon agencies.....	9,170 00	
Individual accounts.....	12 00	
Cash .....	272 91	
New England Trust Co., Boston deposit account.....	13,343 83	
Notes receivable.....	35,000 00	
	<hr/>	\$2,149,186 67

*State of Ohio, County of Erie, ss.:*

J. L. Moore, Treasurer of the Columbus, Springfield and Cincinnati Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

J. L. MOORE, *Treasurer.*

[SEAL OF R. R.]

## COLUMBUS AND TOLEDO RAILROAD COMPANY.

Name of road: Columbus & Toledo Railroad.

By whom owned: Columbus & Toledo Railroad Company.

By whom operated: Columbus & Toledo Railroad Company.

Name of Company making this report: Columbus & Toledo Railroad Company.

General office at Columbus, O.

Principal office in Ohio at Columbus.

Address correspondence relating to this report to T. J. Janney, at Columbus, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

No change since last report.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
M. M. Greene .....	President .....	Columbus, O. ....	.....
F. H. Medary .....	Secretary and Treasurer...	" .....	.....
T. J. Janney .....	Auditor .....	" .....	.....
Orland Smith .....	General Manager .....	" .....	.....
Geo. R. Carr .....	General Superintendent...	" .....	.....
F. B. Sheldon .....	Chief Engineer .....	" .....	.....
W. H. Harrison .....	General Passenger Agent..	" .....	.....
W. A. Mills .....	General Freight Agent .....	" .....	.....
W. H. Harrison .....	General Ticket Agent .....	" .....	.....
M. M. Greene .....	Executive Committee. {	" .....	.....
Wm. G. Deshler .....		" .....	.....
D. S. Gray .....		" .....	.....
Samuel M. Young .....		Toledo, O. ....	.....
Total Salaries .....	.....	.....	\$13,300

### DIRECTORS.

Name.	Residence.	Name.	Residence.
M. M. Greene .....	Columbus, O. ....	J. D. Van Deman .....	Delaware, O.
Wm. G. Deshler .....	" .....	A. H. Kling .....	Marion, O.
David S. Gray .....	" .....	McD. M. Carey .....	Crawford, O.
E. L. Hinman .....	" .....	Samuel M. Young .....	Toledo, O.
P. W. Huntington .....	" .....	A. L. Backus .....	" .....
Isaac Eberly .....	" .....	H. S. Walbridge .....	" .....
Orland Smith .....	" .....		

## CAPITAL STOCK.

Capital stock authorized by law—Amount—common.....	\$2,500,000 00
Number of shares—common.....	50,000
Par value of each—common.....	\$50 00
Capital stock authorized by vote of company—common.....	2,500,000 00
Amount subscribed—common.....	1,039,500 00
Total paid in capital stock—common.....	1,039,500 00
Increase since June 30, 1880—common...	107,459 40
Average amount paid in per mile of single main track, 117.7 miles...	8,831 77
Proportion of same for Ohio.....	All.
Capital stock issued, and on what account, as follows :	
For subscriptions paid in cash, 20,790 shares—common.....	\$1,039,500 00
Total number of shares, common, 20,790 ; amount.....	1,039,500 00
Stockholders, residents of Ohio.....	1,240
Amount of stock held by them June 30, 1881.....	\$999,500 00
Agents authorized to transfer stock: None but Secretary of the company.	

## FUNDED DEBT.

1. Kind of bond or oblig'tions.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Coupon bond	1st mortgage .....	Aug. 1, 1875	Aug. 1, 1905	7	\$2,500,000	\$1,988,000
Non "	.....	.....	.....	.....	.....	486,000
Coupon bond	2d mortgage .....	Sept. 1, 1880	Sept. 1, 1900	7	600,000	422,000
Total .....	.....	.....	.....	.....	\$3,100,000	\$2,896,000

Average amount per mile of single main track (117.7 miles).....	\$24,604 93
Proportion of same for Ohio (All) .....	All.
Increase since June 30, 1880.....	423,000 00

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$155,832 50
All other debts, current credit balances, etc .....	67,030 79
Total unfunded debt.....	222,863 29
Cash securities, debit balances, etc., available to payment....	80,477 74
Net unfunded debt .....	\$142,385 55
Average amount per mile of single main track .....	\$1,209 73
Proportion of same for Ohio .....	All.
Increase since June 30, 1880.....	68,533 82
Total net debt liabilities.....	3,038,385 55

Average amount per mile of single main track.....	\$25,814 66
Proportion of same for Ohio.....	All.
Total of paid in stock and debt .....	4,077,885 55
Total average amount per mile .....	\$34,646 43
Proportion of same for Ohio.....	All.

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expend- itures to July 1, 1881.
Right of way.....	\$201,705 34	\$1,806 23	\$203,511 57
Civil engineering.....	139,331 95	.....	139,331 95
Bridges .....	1,870,495 42	21,39 728	1,891,894 14
Timber and ties .....			
Superstructure .....			
Iron rails, chairs and spikes—steel rails			
Fencing.....	95,381 21	.....	95,381 21
Passenger and freight stations. ....	31,863 58	.....	31,863 58
Telegraph .....	6,235 93	.....	6,235 93
Interest and discount.....	450,118 72	.....	450,118 72
Toledo docks and accretions.....	247,727 16	184,985 87	432,713 03
Total expenditures for construction	\$5,042,859 31	\$208,190 82	\$3,251,050 13

## ROAD ACQUIRED BY PURCHASE.

Average cost per mile of road constructed (single main track, 117.7 miles).....	\$27,621 50
Proportion of same for Ohio (117.7 miles) .....	All.

## COST OF EQUIPMENT OWNED BY COMPANY.

18 locomotives.....	\$139,711 15
15 first-class passenger cars.....	64,124 11
353 box freight cars.....	188,325 00
1,454 platform cars (coal cars) .....	469,981 54
5 baggage and and express cars.....	12,450 00
Hand cars, not charged to equipment account.....	.....
11 caboose cars .....	8,875 00
1 director's and superintendent's car { Owned jointly with } Half cost .... {	2,250 00
1 pay car ..... { C. & H. V. R. R. .... } " ..... {	2,275 00
Total cost of railroad equipment owned by company.....	887,991 80
Additions within the year ending June 30, 1881 .....	355,284 38
Average amount per mile (of single main track 117.7 miles).....	7,544 53
Proportion of same for Ohio.....	All.
Total for road and equipment .....	4,139,041 93



Total average amount per mile (of single main track, 117.7 miles) .....	35,166 03
Proportion of same for Ohio.....	All.
Total permanent investment .....	4,139,041 93
Proportion for Ohio.....	All.
Average per mile (of single main track, 117.7 miles).....	35,166 03

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Columbus to Toledo .....	123.7 miles.	All.
Total single main track .....	123.7 miles.	All.
Aggregate of sidings and other tracks.....	16.51 "	All.
Total length laid with rail computed as single track...	140.21 miles.	All.
Laid with steel rail.....	69.50 "	All.
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Franklin .....	12.21	0.87	13.08
Delaware.....	22.21	2.33	24.54
Marion.....	19.53	2.85	22.38
Wyandot.....	22.14	2.49	24.63
Seneca .....	15.96	2.16	18.12
Wood .....	25.72	3.21	28.93
Lucas .....		2.60	2.60
Totals .....	117.77	16.51	134.28
Steel rail .....	69.50		69.50

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4.75 feet.
Grade—Maximum, per mile .....	26 "
Longest maximum .....	8,000 "
Aggregate length of maximum.....	138 miles.
Curvature—Shortest radius .....	1,042 feet.
Aggregate length of shortest curve .....	2,084 "
Aggregate length of all curves.....	8.25 miles.
Aggregate length of tangent.....	109.52 "
Rail—Iron—On road.. .....	96.54 "
Average weight per yard .....	60 lbs.
Steel—On road.....	139.00 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile.....	3,000
Number laid during the year .....	18,479
Ballasted—On whole line.....	117.77 miles.
In Ohio.....	117.77 "
With gravel, rock, crushed stone and sand.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood,	8; greatest age, 5½ years; aggregate length..	397 feet.
Iron,	3; “ 5½ “ “ ..	488 “

Total..... 885 “

Trestles—35; greatest age, 5½ years; greatest height, 45 ft.; greatest length, 854 feet; aggregate length, 1,914 feet.

Length of shortest span of truss, 20 feet; of longest—wood, 120; iron, 150; greatest length of beams between points of support, if not trussed, 16 ft.

Greatest space between cross ties upon bridges and trestles, 12 inches; length of ties, 8 to 13 feet.

Number of track stringers, generally 4, occasionally 2.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Once every 3 months.

Are the examinations analytical, and are they made by a competent person? Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.
Number miles fencing, computed as single line.....	231.37
Kind of fencing, as follows:	
Post and board (average cost per rod, \$1.00).....	All.
Average cost of same per rod, \$1.00.	
Length of road unfenced, and the reason therefor. ....	4.17
Reason—in towns not requiring fence.	

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

I., B. & W. and C., C. & I. C. R'ys at Columbus.

C., C., C. & I. R'y at Delaware.

N. Y., P. & O. and C., C., C. & I. Railroads at Marion.

P., Ft. W. & C. R'y at Upper Sandusky.

I., B. & W. R'y at Carey.

B. & O., O. C. and L. E. W. R'ys at Fostoria.

Number of crossings of highways at grade in this State without protection, 140.

Number of crossings of highways under railroad, 1.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated .....	123.7; in Ohio.....	All.
Miles of same owned by railroad company jointly with		
W. U. Telegraph Company .....	123.7; “ .....	All.

## STATIONS.

Passenger and freight, in Ohio.....	27
Number with telegraph communication.....	19
Number of same operated by railroad company .....	All.

Is pay received for messages sent over line owned by railroad company ?

Charges for commercial messages.

## ROLLING STOCK.

Locomotives .....	18; average weight—lbs.....	110,000
Express and baggage cars.....	5; “ .....	38,000
Passenger cars .....	15; “ .....	40,000
Freight cars .....	1,454; “ .....	18,000
Other cars .....	13	

Number of locomotives equipped with train brakes, 7.

Kind of brake: Westinghouse Air Brake.

Number of cars equipped with train brakes, 19.

Kind: Westinghouse Air Brake.

Number of passenger and baggage cars with “Miller Platform”, 20.

Method of bridging between passenger cars, when two or more are run in trains: Miller Platform.

Are all cars run on this road heated and lighted as prescribed by law? As far as practicable.

State methods of heating cars used for the transportation of passengers: Patent car stove.

Means of lighting same: Oil lamps.

## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	25 miles per hour.
Mail and accommodation .....	25 “
Freight trains .....	10 “

## EMPLOYEES.

Superintendents .....	2
Telegraph operators.....	22
Engineers .....	17
Baggagemen.....	4
Flagmen, switch-tenders and watchmen .....	17
Laborers .....	10
Clerks .....	8
Train dispatchers.....	2
Firemen.....	17
Mechanics .....	20
Conductors .....	15
Brakemen .....	39

Station Agents .....	27
Section men .....	104
Other employes .....	15

Total number employed by company in operating line ..... 329

EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American Express Company.

Terms: From 35 to 55 cents per 100 pounds.

AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.	
Locomotives	Passenger—all still in use .....		Ties .....	Oak—none worn out yet.
	Freight—all still in use .....			Pine—none.
Cars.....	Passenger “ .....		Bridges.....	Hemlock—none.
	Baggage “ .....			Cedar “ .....
	Box “ .....		Bridges.....	Wooden ....
	Stock “ .....			Iron .....
	Coal “ .....			Combination
Rails .....	Flat “ .....		Telegraph poles	Trestles .....
	Iron “ .....	6½		Piling .....
Joint fastenings	Steel—none worn yet .....		Fence posts—Cedar—still in use.	None worn sufficiently to form estimate.
	“ .....			
Frogs.....	“ .....	6½		

RATES OF TRANSPORTATION.

PASSENGERS.

Fare charged per mile:	Highest.	Lowest.	Average.
For distances less than 8 miles .....	.05 Cts.	.03 Cts.	ab't 4½ Cts
over 8 miles—First class.....	.03	.01½	
Second class.....	.03	.01½	
Excursion .....	.02½	.0161	

FREIGHT.

Rate per 100 lbs. per mile when freight weighs less than a ton :

First class.....	.01 Cts.	.0024 Cts.	} Can't give average.
Second class.....	.01	.002	
Third class.....	.01	.0015	
Fourth class.....	.01	.0012	
Fifth class.....	.0055	.0008	
Special class .....	.0037	.00064	

## Rate per ton per mile on freight carried less than 30 miles:

First class.....	.05	.05	.05
Second class.....	.05	.05	.05
Third class .....	.05	.05	.05
Fourth class .....	.05	.04½	} Can't give average.
Fifth class .....	.04½	.04	
Special class.....	.04	.02	

## Rate per ton per mile on freight carried more than 30 miles:

First class .....	.05	.048	} Can't give average.
Second class.....	.0475	.04	
Third class .....	.045	.032	
Fourth class.....	.0425	.024	
Fifth class.....	.04	.017	
Special class.....	.03	.007	

## Rate per ton per mile for—

Coal—Carried ten miles or more.....	.05	.007	
carried less than ten miles.....	.05	.04	
Lig iron—Carried ten miles or more.....	.05	.008	
carried less than ten miles.....	.05	.05	.05
Limestone—Carried ten miles or more.....	.05	.008	
carried less than ten miles.....	.05	.045	
Iron ore—Carried ten miles or more.....	.05	.008	
carried less than ten miles.....	.05	.045	
Undressed stone or lumber—Carried ten miles or more .....	.05	.01	
Undressed stone or lumber—Carried less than ten miles.....	.05	.05	.05
No charge made for loading or unloading.			

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Ballasting—Miles of main track ballasted with rock.....		3 miles.
Rail laid—Steel, 60 lbs. per yard—miles of track .....		6½ "
Train mileage—Passenger .....	230,562	
Freight .....	333,175	
Mixed .....	22,750	
Construction.....	6,377	
Total.....		592,864
Car mileage—Passenger.....	492,119	
Express and baggage .....	216,832	
Freight—loaded... ..	6,881,582	
empty.....	1,376,316	
Caboose .....	330,090	
Construction and other, about.....	36,000	
Total.....		9,332,939
Fuel consumed—Wood, 655½ cords; coal, 18,589 tons; total cost .....		\$33,771 20
Losses, etc., paid—On goods and baggage.....		148 81

For injuries in Ohio, fatal and non-fatal:		
To employes .....	\$178	00
To others .....	500	00
	<hr/>	<hr/>
Total.....		\$678 00
For animals killed in Ohio:		
Horses, 4.....	\$220	00
Mule, 1.....	75	00
Cattle, 6.....	67	50
Sheep, 21.....	55	00
Hogs, 5.....	38	37
	<hr/>	<hr/>
Total.....		\$455 87

## TRANSPORTATION.

Passengers—Number carried, local.....	191,648	
through.....	16,276	
Total.....		207,924
Average number carried in each car per trip .....		25.2
Average number of miles traveled by each.....		32.86
Total mileage, or number carried one mile .....		6,843,776
Average amount received for each.....		78.15 cents.
Average amount <i>per mile</i> received for each.....		2.38 cents.
Freight—Tons carried, local.....	180,408	
through .....	484,645	
Total .....		665,053
Average tons in each loaded car per trip .....		About 7
Average tons in each loaded car per mile.....		9.94
Total movement, or tons carried one mile.....		68,425,114
Average amount received for each ton.....		84.8 cents.
Average amount <i>per mile</i> received for each ton.....		.82 cents.
Average amount received for each ton through freight .....		99.2 cents.
Average amount received for each ton local freight .....		.46 cents.
Articles transported :		
	Tons.	Per cent.
Coal .....	390,749	58.7
Stone, lime, sand, etc.....	25,521	3.8
Ores .....	15,714	2.4
Pig and bloom iron.....	43,779	6.5
Lumber and other forest products.....	113,718	17.3
Grain, flour, and other agricultural products .....	24,487	3.7
Live stock .....	6,678	1.0
Animal products .....	6,909	1.0
Miscellaneous .....	37,498	5.6
Total tonnage yielding revenue.....	665,053	100
Supplies for company's use.....	About 8,000	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local .....	\$122,327	27
through .....	40,164	48
Total .....		\$162,491 75
Freight transportation—local .....	\$83,137	58
through .....	480,767	84
Total .....		\$563,905 42
Mail service.....		8,147 20
Express service.....		9,351 22
Other sources.....		29,151 53
Total earnings of line operated included in this report.....		\$773,047 12

OPERATING EXPENSES.

Maintenance of way and structures .....	\$127,732	72
Maintenance of cars.....	21,977	50
Motive power .....	114,345	36
Conducting transportation.....	115,609	10
General expenses:		
Taxes in Ohio .....	\$23,504	90
Salaries .....	30,226	31
Other general expenses of operating.....	6,670	71
	<hr/>	60,401 92
Total operating expenses, being 57.05 per cent. of earnings.....	\$440,066	60
Net earnings of 124 miles operated.....	332,980	52
Rentals paid (for use of road, track, depots, equipment), etc.:		
C., C. & I. C. Division, P., C. & St. L. R'y.....	\$1,000	00
Pennsylvania Co., operating Northwestern Ohio R'y...	975	30
Columbus and Hocking Valley R. R.....	10,636	10
	<hr/>	12,611 40
Net income over operating expenses and rentals paid .....	\$320,369	12
Percentage of same to capital stock and debt, 7.85.		
Percentage of to total means applied to construction, etc., 7.74.		
Per mile of earnings .....	\$6,234	25
operating expenses .....	3,650	63
net earnings.....	2,583	62



## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock .....	\$107,459 40	
Sale of bonds of company, \$423,000 ; at par .....	423,000 00	
Increase of floating debt .....	68,533 82	
Installment interest received.....	24,369 78	
	<hr/>	\$623,363 00

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$201,740 00	
Interest on floating debt .....	6,513 48	
Construction of new work .....	195,144 55	
Additional equipment .....	355,284 38	
Additional real estate.....	13,046 24	
Interest on lease (Pennsylvania Company).....	23,212 92	
Interest on scrip .....	12,000 38	
	<hr/>	\$806,941 95

## CONDENSED GENERAL BALANCE SHEET, JULY 1ST, 1881.

## LIABILITIES.

Stock .....	\$1,039,500 00	
Installment interest, scrip.....	2,260 03	
Bonds issued, 30 years, 7 per cent. first mortgage.....	2,474,000 00	
Bonds issued, 20 years, 7 per cent. second mortgage .....	422,000 00	
Bills payable (principally real estate notes) .....	155,832 50	
Due agents.....	19,361 08	
Due connecting roads.....	31,368 24	
Coupons unpaid.....	2,380 00	
Contingent account.....	79,167 91	
Due on other accounts.....	31,022 52	
	<hr/>	\$4,256,892 28

## ASSETS.

Cash on hand .....	\$29,666 99	
Construction .....	2,418,416 01	
Equipment .....	887,991 80	
Real estate.....	94,792 38	
Right-of-way .....	203,511 57	
Fencing.....	95,381 21	
Telegraph lines.....	6,235 93	
Toledo docks and accretions .....	404,772 53	
Supplies on hand.....	19,334 27	
Bills receivable.....	170 00	

Toledo, Ann Arbor and Grand Trunk first mortgage bonds (10) .....	9,919 64
Due from agents .....	18,038 34
Due from connecting roads.....	18,940 20
Due from other accounts.....	21,780 91
Interest on dock purchase .....	27,940 50
	<hr/> \$4,256,892 28

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	Nov. 3	Wilson B. Miller ..	Unknown ..	Stealing ride and fell off .....	Killed.
2	16	Wm. Wright.....	" ..	Driving across track..	Seriously inj'ed
3	Dec. 10	Clara Hansbaugh..	" ..	Crossing track in carriage and struck by the engine.....	Killed.
4	10	Chas. Tuller .....	" ..	Crossing track in carriage and struck by the engine.....	Arm broken.
5	10	Anna Artz.....	" ..	Crossing track in carriage and struck by the engine.....	Slightly injured.
6	Dec.	Chas. Kelley.....	Brakeman ..	.....	Lost two fingers.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Others—Riding or driving across track.....	1
Stealing ride on freight train .....	1
Total.....	<hr/> 2

## PERSONS INJURED—CAUSES.

Others—Driving or riding across track.....	3
Coupling, or caught between cars and engine.....	1
Total .....	<hr/> 4

## RECAPITULATION.

Killed—Others—At stations and highway crossings.....	1
Stealing rides .....	1
Total killed .....	<hr/> 2
Injured—Employees—misconduct or want of caution.....	1
Others—At stations and highway crossings.....	3
Total injured .....	<hr/> 4

*State of Ohio, County of Franklin, ss.:*

M. M. Greene, President of the Columbus and Toledo Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

M. M. GREENE,

*President.*

Subscribed and sworn to before me, this 19th day of October, A. D. 1881.

[SEAL.]

F. H. MEDARY,

*Notary Public in and for Franklin county, O.*

## COLUMBUS, WASHINGTON AND CINCINNATI RAILROAD COMPANY.

---

Name of road: Columbus, Washington and Cincinnati Railroad.

By whom owned: E. L. Harper *et al.*

By whom operated: Same.

General office at Dayton, Ohio.

Principal office in Ohio at Dayton, Ohio.

Address correspondence relating to this report to J. E. Gimperling, Manager, at Dayton, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The certificate of incorporation of the Waynesville, Port William and Jeffersonville Railroad, was filed with the Secretary of State December 9, 1875, and is recorded in volume 15, page 327, of the Records of Incorporations, in that office.

At the November term, A.D. 1877, of the Court of Common Pleas in and for Fayette county, on to wit: the 21st day of November, by a decree of that court the name of the road was changed to the Columbus, Washington and Cincinnati Railroad Company, and a certified copy of the decree was filed in the office of the Secretary of State on the 27th day of November, 1877, recorded in volume 17, page 132, of the Records of Incorporation. On the 9th day of September, A.D. 1878, by a decree of the Court of Common Pleas in and for Greene county, Ohio, Mr. J. E. Gimperling was appointed and duly qualified as Receiver of the Columbus, Washington and Cincinnati Railroad Company, and was placed in possession of said property as Receiver.

The Receiver remained in possession of the property until August 6, 1879, when it was sold under proceedings for foreclosure of first mortgage, to J. W. Merchant *et al.*, and was operated under the same name by J. E. Gimperling, as manager for the purchasers. On February 15, 1881, the purchasers, J. W. Merchant *et al.*, sold the property to E. L. Harper *et al.*, and it was operated under the same name, by J. E. Gimperling as manager. Neither of the purchasers were reorganized into another company.

The manager reports the account of J. W. Merchant *et al.*, prior to February 15, 1881, and of E. L. Harper *et al.*, February 15, to June, 30, 1881.

The stock and debt of the company were practically made worthless by the proceeds of foreclosure being insufficient to meet the mortgage debt.

Articles of incorporation have been filed with the Secretary of State for reorganization, to be known as the Cincinnati, Columbus and Hocking Valley Railroad Company. The organization will be perfected in a few days.

#### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. W. Merchant .....	President .....	Allentown, Ohio .....	
J. M. Hussey .....	Vice President .....	Bowersville, " .....	
F. Sprague .....	Auditor .....	Toledo, " .....	\$50 00
J. E. Gimperling .....	General Manager .....	Dayton, " .....	50 00
Total salaries per month.....			\$100 00

#### DIRECTORS.

Name.	Residence.	Name.	Residence.
J. W. Merchant .....	Allentown, O....	Silas Sparks.....	Bowersville, O.
J. M. Hussey .....	Bowersville, ...	Noah Stingley.....	"
Alfred M'Kay .....	" .....	A. W. Carpenter .....	"
W. F. M'Kay .....	Mt. Pleasant, ...	A. Harlan.....	"
J. H. Kirke .....	M'Kays, ...	John Blair.....	New Burlington.
S. L. Gerrard .....	Bowersville, ...	Elijah Allen .....	Allentown.
H. Compton.....	" .....		

#### CAPITAL STOCK.

Capital stock authorized by law—

Amount—common.....	\$200,000 00
Par value of each—common.....	50 00
Amount subscribed—common (this debt liquidated by the sale of the road August 6, 1879).....	81,050 00
Total paid in capital stock—common.....	67,300 00
Average amount paid in per mile of single main track (23.39 miles) ....	2,884 00
Capital stock issued.....	44,250 00

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Amount of authorized issue.	6. Amount actually issued.
First mortgage .....	Mortgage.....	1877	July, 1897.. .....	\$135,000 00	\$120,000

This debt liquidated by the sale of the road August 6, 1879.

Average amount per mile of single main track (23.39 miles) ..... \$5,755 00

## OTHER INDEBTEDNESS.

They may be stated as substantially the same as reported June 30, 1878.

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Total expenditures to July 1st, 1881.
Right of way..... Civil engineering.... Grading and masonry .....	\$154,000 00
Bridges .....	
Timber and ties.....	
Superstructure .....	
Iron rails, chairs and spikes.....	
Fencing .....	
Passenger and freight stations .....	300 00
Interest and discount .....	1,000 00
Contingent expenses .....	800 00
Total expenditures for construction .....	\$156,100 00

This account is substantially the same as reported for the year ending June 30, 1878. But little was done after that date up to September 10, 1878, at which time a Receiver was appointed, who found the accounts of the company so confused that he was unable to state them with greater accuracy to the court than as above.

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 1 .....	\$4,800 00
First class passenger cars, 1.....	3,800 00
Baggage " 1.....	
Box freight cars, 14 .....	7,100 00
Platform " 6 .....	

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Washington C. H., O., via Allentown, O., to Waynesville, O., 37 miles.

Length graded, not laid with rail, 3 miles.

On what portion of the line: South of New Burlington. Washington C. H. to Allentown was never graded. This portion was, at first, in 1878, operated under a lease of the Dayton & Southeastern R. R., and after the Receiver was appointed, in September, 1878, the lease was given up, and the road operated by Receiver only between Allentown and New Burlington (20.18 miles), and since only between these points.

Proposed gauge, 36 inches.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Allentown to New Burlington.....	20.18 mi.	20.18 mi
Total single main track.....	20.18 mi.	20.18 mi.
Aggregate of sidings and other tracks.....	.07 mi.	.07 mi.

Total length laid with rail computed as single track. .... 20.25 mi. 20.25 mi.

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Fayette .....	3.20	.03	3.23
Greene .....	5.50	.02	5.52
Clinton.....	11.48	.02	11.50
Total .....	20.18	.07	20.25

## GAUGE, GRADE, RAILS, ETC.

Gauge.....	3 feet.
Rail—Iron—On road .....	20.18 miles.
Average weight per yard .....	35 lbs.

## TRESTLES, ETC., IN OHIO.

Trestles—25; greatest age, 3 years; greatest height, 35 feet; greatest length, 120 ft.; aggregate length, 2,250 feet.

Length of shortest span of truss, 40 ft.; of longest, 100 ft.; greatest length of beams between points of support, if not trussed, 20 ft.

Greatest space between cross ties upon bridges and trestles, 30 inches; length of ties, 6 feet.

Number of track stringers, 2.



Are all bridges and trestles provided with guard rails? Nearly all.

Do all bridges and trestles receive stated examinations? Are carefully watched, and needed repairs made as required.

Fencing—Very little done.

## CROSSINGS.

Number of crossings of highways at grade in this State without protection ..... 16

## STATIONS AND TELEGRAPH.

## STATIONS.

Passenger and freight (number)..... 7; in Ohio... 7

## ROLLING STOCK.

Locomotives .....	1; Average weight.....	31,000 lbs.
Express and baggage cars.....	1; " .....	16,000 "
Passenger cars .....	1; " .....	16,000 "
Freight cars .....	14; " .....	12,000 "
Other cars .....	6; " .....	8,000 "

Method of bridging between passenger cars, when two or more are run in trains:

Only run one combination car in train.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Coal burning safety stoves.

Means of lighting same: 300° fire test carbon oil.

## SPEED OF TRAINS.

Freight trains ..... 10 miles per hour

## EMPLOYES.

Engineers .....	1
Clerks .....	2
Firemen .....	1
Wipers .....	1
Conductors.....	1
Brakemen .....	1
Station agents .....	7
Section men.....	10
Other employes .....	1

Total number employed by company in operating line..... 25

Proportion for Ohio..... 25

RATES OF TRANSPORTATION.

PASSENGERS.

	Highest.	Lowest
Fare charged per mile—For distances less than 8 miles.....	10c.	3c.
For distances over 8 miles—1st class.....	3c.	2c.

DOINGS OF THE YEAR ENDING JUNE 30TH.

Train mileage—Mixed .....	14,600
Fuel consumed—Coal, 238 $\frac{700}{2000}$ tons.....	\$643 67
Losses, etc., paid—On goods and baggage .....	9 32

TRANSPORTATION.

Passengers—Number carried, local and through.....	2,392
Average number of miles traveled by each.....	7.83
Total mileage, or number carried one mile .....	18,740
Average amount received for each.....	15 $\frac{1}{2}$ cents.
Average amount <i>per mile</i> received for each .....	.01.96 "
Freight—Tons carried, local and through .....	12,417 $\frac{455}{2000}$
Total movement, or tons carried one mile ....	140,389 $\frac{1493}{2000}$
Average amount received for each ton.....	38 cents.
Average amount <i>per mile</i> received for each ton.....	.03.37 "
Average cost per ton freight per mile.....	.04.06 "
Average amount received for each ton through freight.....	} .38 "
Average amount received for each ton local freight.....	
Average cost each ton through freight.....	} .46 "
Average cost each ton local freight.....	

Articles transported:	Tons.	Per cent.
Coal .....	887.100	.07
Stone, lime, sand, etc.....	2,671	21.5
Manufactured iron .....	100	.....
Lumber and other forest products. ....	2,716.1195	.22
Grain, flour, and other agricultural products.....	3,559.178	27.7
Live stock.....	2,103.845	16.8
Animal products .....	9.1551	00.7
Manufactures, including agricultural implements ..	8.1500	00.6
Merchandise .....	457.1286	03.5
Miscellaneous .....	3.1700	00.2

Total tonnage yielding revenue .....	12,417.455	100.
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EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

EARNINGS.

Passenger transportation—local.....	\$367 40
Freight transportation—local.....	4,731 27
Mail service.....	1,207 68
Other sources .....	970 06

Total earnings of line operated included in this report.....	\$7,276 41
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## OPERATING EXPENSES.

Maintenance of way and structures.....	\$3,092 23	
Maintenance of cars .....	165 91	
Motive power.....	2,946 39	
Conducting transportation .....	1,117 86	
General expenses:		
Taxes in Ohio.....	\$241 12	
Salaries .....	1,200 00	
Other general expenses of operating.....	5 00	
	<hr/>	1,446 12
Total operating expenses, being 120.50 per cent of earnings.....		\$8,768 51
Net deficit of 20.18 miles operated.....		1,492 10
Per mile of earnings, \$360.57; proportion for Ohio.....		All.
"    operating expenses, \$444.51; proportion for Ohio.....		All.
"    deficit, \$73.94; proportion for Ohio.....		All.

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

E. L. Harper et al., owners.....	\$1,000 00
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## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Bills payable.....	\$1,000 00	
Accounts payable .....	745 00	
Freight earnings .....	\$4,731 27	
Passenger earnings.....	367 40	
Mail .....	1,207 68	
Other sources .....	970 06	
	<hr/>	7,276 41
E. L. Harper et al., owners.....		1,000 00
Total .....		\$10,021 41

## ASSETS.

Accounts receivable and cash .....	\$706 98	
Operating expenses.....	8,768 51	
Deficit.....	545 92	
	<hr/>	
Total.....		10,021 41

*State of Ohio, County of Montgomery, ss.:*

John E. Gimperling, General Manager of the Columbus, Washington & Cincinnati Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed)

J. E. GIMPERLING, *Gen'l Manager.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 12th day of December, A. D. 1881.

THOS. CORWIN,

[SEAL.]

*Notary Public, in and for Montgomery County, O.*

## COLUMBUS AND XENIA RAILROAD COMPANY.

---

Name of road: Columbus & Xenia Railroad.

By whom owned: Columbus & Xenia Railroad Company.

By whom operated: P., C. & St. L. Railway Company.

By what authority; Lease.

Name of person making this report: Robert S. Smith, Treasurer Columbus & Xenia Railroad Company.

General office at Columbus, Ohio.

Principal office in Ohio at Columbus.

Address correspondence relating to this report to Robert S. Smith, at Columbus, Ohio.

### STOCK AND DEBT.

#### CAPITAL STOCK.

Amount authorized—general.....	\$1,800,000 00
Amount issued.....	1,786,200 00
Par value of shares.....	50 00
Total paid in capital stock.....	\$1,786,200 00
Average amount paid in per mile, (54.74 miles).....	\$32,630 62
Stockholders, residents of Ohio, 230.	
Amount of stock held by them June 30, 1880, (29,332 shares).....	1,466,600 00
Agents authorized to transfer stock: Robert S. Smith, Treasurer and Secretary, Columbus, Ohio.	
Number of shares transferred within the year at such agencies, 837.	

#### FUNDED DEBT.

1st mortgage 7 per cent. bonds, due September 1, 1890.....	\$302,000 00
Total funded debt .....	\$302,000 00
Average amount per mile.....	\$5,516 98
Other indebtedness: None.	
Total of paid in stock and debt.....	\$2,088,200 00
Total average amount per mile.....	\$38,147 60

### COST OF ROAD EQUIPMENT, Etc.

#### ROAD CONSTRUCTED BY COMPANY.

Total expended by company for construction.....	\$1,493,146 00
Average cost per mile of road owned by company.....	\$27,277 06
Equipment: None.	
Value of real estate included, exclusive of roadway: None.	

## CHARACTERISTICS, ETC.

## LINE OWNED BY COMPANY—MILES.

Single main track—Columbus to Xenia, all in Ohio.....	54.74
Aggregate of sidings and other tracks .....	9.98

Total length laid with rail computed as single main track..... 64.72

Length in Ohio distributed as follows :

County.	Main track.	Sidings, etc.	Total.
Franklin.....	13	4.47	17.47
Madison .....	19 04	2.11	21.15
Clarke .....	9 66	1.02	10.68
Greene .....	13.04	2.38	15.42
Totals .....	54.74	9.98	64.72

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

From lessee for rent of road.....	\$142,896 00	
Income on bonds, etc.....	21,840 00	
Expense of organization.....	2,500 00	
All other sources of income for year.....	7,729 10	
		\$174,965 10

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$21,140 00	
Dividends, rate 8.40 per cent. on general stock .....	150,048 80	
General expense of organization.....	2,500 00	
		\$173,680 80

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1880.

## LIABILITIES.

Capital stock .....	\$1,786,200 00	
Funded debt .....	302,000 00	
Surplus .....	154,131 56	
		\$2,242,331 56

## ASSETS.

Lease to Little Miami R'y Co.....	\$2,137,134 54	
Columbus and Xenia R. R. stock.....	17,050 00	
United States 5's (\$4,000), cost.....	4,480 00	
First mortgage 7 % bonds P., C. & St. L. R'y.....	39,000 00	
"                    "            Col. & Toledo R. R.....	41,000 00	
Cleveland and Cincinnati Telegraph stock.....	2,000 00	
Cash in hands of Treasurer.....	1,667 02	
	<hr/>	\$2,242,331 56

## OFFICERS.

Directors—Joseph R. Swan.....	Columbus, Ohio.
Henry C. Noble.....	"
Robert Neil.....	"
George M. Parsons.....	"
P. W. Huntington.....	"
Wm. Dennison (resigned).....	"
John W. Andrews.....	"
R. A. Harrison.....	London, Ohio.
Alfred Thomas.....	Columbus, Ohio.
Thomas D. Messler.....	Pittsburgh, Pa.
Henry Hanna.....	Cincinnati, Ohio.
C. P. Cassidy.....	"
President, Joseph R. Swan.....	Columbus, Ohio.
Secretary and Treasurer, Robert S. Smith.....	"



## CONNOTTON VALLEY RAILWAY COMPANY.

---

Name of road : Connotton Valley Railway.

By whom owned : The Connotton Valley Railway Company.

By whom operated : The Connotton Valley Railway Company.

By what authority : Under general Railroad Law of Ohio

Name of company making this report : The Connotton Valley Railway Company.

General office at Canton, Ohio.

Principal office in Ohio at Canton, Ohio.

Address correspondence relating to this report to A. B. Proal, Secretary and Treasurer, Canton, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Connotton Valley Railway Company was formed by a consolidation of the Connotton Valley Railroad Company and the Connotton Northern Railway Company. The consolidation agreement was entered into by the directors of the two Companies October 25, 1880, and approved by the stockholders November 8, 1880. The election of Directors of the consolidated company took place December 1, 1880.

The Connotton Valley Railroad Company was incorporated under the general laws of Ohio, by filing its certificate to build a railroad from Bowerston to Youngstown, Ohio, the corporate name being the Youngstown and Connotton Valley Railroad Company.

That company purchased the Ohio and Toledo Railroad after it was sold at judicial sale, and at that time constructed from Dell Roy to Minerva. The purchasing company changed its route and terminus, making Canton the northern terminus instead of Youngstown, and by decree of court the name was changed to Connotton Valley Railroad Company. The Connotton Northern Railway Company was incorporated under the general laws, by filing its articles to build a road from Canton to Fairport Harbor, but the northern terminus was afterwards changed to Cleveland. When the road first named was built to Canton, and the second in course of construction, they were consolidated as stated.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. J. Rotch.....	President.....	New Bedford.....	.....
Sam'l Allen.....	Vice-President.....	Dell Roy.....	.....
A. B. Proal.....	Secretary and Treasurer...	Canton, Ohio.....	.....
C. G. Patterson.....	General Manager. ....	Boston, Mass.....	.....
Wm. N. Moffett.....	Acting Superintendent.....	Canton, Ohio.....	.....
Wm. F. Ellis.....	Chief Engineer.....	" ".....	.....
W. J. Rotch.....	} Executive Committee. {	New Bedford.....	.....
Jas. B. Thomas.....		Boston.....	.....
Cyrus Wakefield.....		Wakefield.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
W. J. Rotch.....	New Bedford....	Wm. A. Lynch.....	Canton, Ohio....
Jas. B. Thomas.....	Boston.....	L. R. Tressel.....	" ".....
A. P. Clarke.....	".....	E. D. Bishop.....	" ".....
A. W. Wickerson.....	".....	A. Thieny.....	" ".....
Cyrus Wakefield.....	Wakefield.....	Sam'l Allen.....	Dell Roy, Ohio..
Sam. Watts.....	Thomaston.....	I. H. Taylor.....	Connotton, " ..
A. B. Proal.....	Canton, Ohio....		

## CAPITAL STOCK.

Capital stock authorized by vote of company—common..... \$3,000,000

Total paid in capital stock—common..... 3,000,000

Capital stock issued, and on what account, as follows:

For consolidation—amount of common..... 3,000,000

Agents authorized to transfer stock: S. W. F. Webb, 95 Milk street, Boston, Mass.

## FUNDED DEBT.

Kind of bond or obligations, consolidation mortgage; if and how secured, mortgage; date of issue, January 10, 1881; when due, November 1, 1910; rate of interest, seven per cent.; amount of authorized issue, \$2,600,000; amount actually issued, \$2,600,000. Before the consolidation of the Connotton Valley Railroad Company, and the Connotton Northern Railway Company, the first named company had issued \$662,000 of first-mortgage bonds, and the second named company had issued \$1,125,000 of first mortgage bonds, which were to be taken up with the bonds of the consolidated company, leaving a surplus of \$813,000 of the new bonds for construction purposes. The old bonds have nearly all been taken up by trustees, under the terms of the consolidated mortgage. The entire issue cannot exceed \$2,600,000.

## COST OF ROAD EQUIPMENT, Etc.

Construction account: As stated in our report for 1880, the road is being built under a contract, by the terms of which the contractor is to complete the road and provide a certain amount of equipment for the whole issue of the company's bonds, in amount \$2,600,000, and the whole amount of the company's stock, \$3,000,000, to be issued to the contractor for the completion of the road.

## COST OF EQUIPMENT OWNED BY COMPANY.

Four locomotives, 2 first-class passenger cars, 6 box freight cars, 26 platform cars, 2 baggage cars, 5 hand cars. The contractor was bound to furnish a certain amount of equipment, which has been placed on the road; the balance the company leases from an equipment company. The cost is known only to the contractor.

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Bowerston via Canton to Cleveland, 118 miles.

Length graded, not laid with rail, 18 miles.

On what portion of the line: 6 miles on Cleveland, and 12 miles on Bowerston end.

Proposed gauge, 36 inches.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Dell Roy to Mogadore.....	60.2	60.2
Total single main track.....	60.2	60.2
Aggregate of sidings and other tracks.....	6.78	6.78
Total length laid with rail computed as single track.....	66.98	66.98
Laid with steel rail.....	46.	46.

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Carroll.....	21.8	2.75	24.55
Starke .....	31.4	3.99	35.39
Portage .....	7.	.04	7.04
Totals .....	60.2	6.78	66.98

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge—Three feet.

Grade—Maximum, per mile..... 52.8 feet.

Longest maximum..... 3½ miles.

Curvature—Shortest radius .....	400 feet.
Aggregate length of shortest radii .....	500 "
Rail—Iron—On road.....	14.2 miles.
Average weight per yard.....	30 lbs.
Steel—On road .....	74.4 miles.
Average weight per yard .....	37½ lbs.
Ties—Average number per mile .....	2,720
Number laid during the year.....	143,342
Ballasted—On whole line .....	27.7 miles.
In Ohio .....	27.7 "
With gravel.	

BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood.....	8;	greatest age....	2 years;	aggregate length, ft..	466
Iron.....	1;	"	4 mos.;	"	161
Total.....					627
Trestles—38; greatest age, 6 years; greatest height, 36 feet; greatest length, 391; aggregate length, 2,050 feet.					
Length of shortest span of truss, 29 ft.; of longest, 103 ft.; greatest length of beams between points of support, if not trussed, 16 ft					
Greatest space between cross ties upon bridges and trestles, 18 inches; length of ties, 6 feet 6 in.					
Number of track-stringers, some 2, some 4, and some 8.					
Are all bridges and trestles provided with guard rails? Not all.					
Do all bridges and trestles receive stated examinations? Yes.					
How often? Monthly.					
Are the examinations analytical, and are they made by a competent person? Yes.					
Tunnels—Wood, 1; length, 693 ft.					

FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	94	94
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.25).		
Wire (average cost per rod, 72 cts.)		

CROSSINGS.

- What railroads cross your road at grade in this State, and at what locality?
- C. & P., Tuscarawas Branch Railroad at Oneida.
- C. & P., Tuscarawas Branch Railroad at Minerva.
- P., Ft. W. & C. Railway at Canton.
- What railroads cross your road either over or under your grade in this State, and where?
- N. Y., P. & Ohio Railroad at Kent.
- C. & Pittsburg Railroad at Earlville.

Number of crossings of highways at grade in this State without protection, 146.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? At grade crossings, all but one.

### STATIONS AND TELEGRAPH.

#### TELEGRAPH LINE.

Miles on line of road operated..... 60.2; in Ohio, 60.2

#### STATIONS.

Passenger and freight ..... 10; in Ohio, 10  
 Number with telegraph communication ..... 10; " 10  
 Number of same operated by railroad company..... 10; " 10  
 Is pay received for messages sent over line owned by railroad company? Railroad  
 does not own line.

### ROLLING STOCK.

Locomotives.....	10; Average weight, lbs .....	42,800
Express and baggage cars.....	3; " " .....	
Passenger cars.....	23; " " .....	
Freight cars.....	435; " " .....	9,500
Other cars.....	3; " " .....	9,500

Above includes not owned by company reporting.

Locomotives, 4; owned by C. V. R'y.

Express and baggage cars, 2; owned by C. V. R'y.

Passenger cars, 2; owned by C. V. R'y.

Freight cars, 20; " " "

Other cars, 12; " " "

Number of locomotives equipped with train brakes, 5.

Kind of brake: Westinghouse air brake.

Number of cars equipped with train brakes, 26.

Kind: Westinghouse air brake.

Number of passenger cars with "Miller Platform," 26.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Stoves.

Means of lighting same: Oil lamps.

#### SPEED OF TRAINS.

Mail and accommodation .....	18 miles per hour.
Freight trains .....	12 "

#### EMPLOYES.

Superintendent .....	1
Telegraph operators .....	3

Engineers.....	10
Flagmen, switch-tenders and watchmen .....	2
Clerks.....	5
Firemen .....	10
Wipers.....	10
Mechanics.....	5
Conductors.....	5
Brakemen .....	10
Station agents .....	10
Section men.....	60
Other employes.....	8

Total number employed by company in operating line..... 139

Proportion for Ohio ... All.

#### EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union Express Co.

Terms: \$75 per month.

#### RATES OF TRANSPORTATION.

##### PASSENGERS.

Fare charged per mile—	Highest.	Lowest.	Average.
For distances less than 8 miles.....	4 Cts.	3 Cts.	3½ Cts.
For distances over 8 miles—1st class .....	4	3	3½
Excursion.....	1.85	1.85	1.85

##### FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

First class.....	7	.....	.....
Second class.....	6	.....	.....
Third class.....	5	.....	.....
Fourth class.....	4	.....	.....

Rate per ton per mile on freight carried less than 30 miles :

First class.....	.038	.0133	.026
Second class.....	.035	.01	.022
Third class.....	.030	.0066	.018

Rate per ton per mile for—

Coal—Carried ten miles or more.....	.037	.037	.037
Carried less than ten miles.....	.025	.05	.025
Pig iron—Carried ten miles or more.....	.050	.....	.....
Carried less than ten miles.....	.020	.....	.....
Limestone—Carried ten miles or more.....	.050	.....	.....
Carried less than ten miles.....	.020	.....	.....
Iron ore—Carried ten miles or more.....	.05	.....	.....
Carried less than ten miles.....	.02	.....	.....
Undressed stone or lumber—Carried 10 miles or more..	.05	.....	.....
Carried less than 10 mi.....	.02	.....	.....

## DOINGS OF THE YEAR ENDING JUNE 30.

Trestles—length filled and converted into embankment.....	325
Grading—Miles of main track graded, all in Ohio.....	48
Ballasting—Miles of main track ballasted with gravel, all in Ohio .....	27.7
Rail laid—Steel, 40 lbs. per yard—miles of track.....	48
Total Train mileage—Mixed.....	69,290
Car mileage—Passenger.....	81,618
Express and baggage .....	56,500
Freight—loaded .....	154,983
empty .....	349,158
Total .....	642,259
Fuel consumed—Coal, 1,209 tons. Total cost .....	\$1,511 25
Losses, etc., paid—For animals killed in Ohio—	
One horse, 12 cattle, 6 sheep.....	149 00

## TRANSPORTATION.

Passengers—Number carried, local .....	53,154	
through .....	807	
Total.....		53,961
Average number carried in each car per trip .....		24.07
Average number of miles traveled by each.....		14.48
Total mileage, or number carried one mile.....		783,003
Average amount received for each.....		40.4 cents.
Average amount <i>per mile</i> received for each.....		2.9 “
Freight—Tons carried, local .....	37,505 16	
through .....	14,087 24	
Total.....		51,592 40
Average tons in each loaded car per trip.....		5.88
Average tons in each loaded car per mile .....		3.21
Total movement, or tons carried one mile .....		914,176.51
Average amount received for each ton.....		.597 cents.
Average amount <i>per mile</i> received for each ton .....		.032 “
Articles transported—	Tons.	Per cent.
Coal.....	42,789.02	81.25
Stone, lime, sand, etc.....	1,122.41	2.13
Ores.....	303.39	0.58
Manufactured iron.....	577.02	1.10
Lumber and other forest products .....	3,286.71	6.24
Grain, flour, and other agricultural products.....	2,037.52	3.87
Animal products .....	30.24	.06
Manufactures, including agricultural implements .....	112.69	.21
Merchandise.....	1,607.26	3.05
Miscellaneous.....	797.76	1.51
Total tonnage yielding revenue.....	52,664.02	100
Supplies for company's use .....	1,946.43	





## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$3,000,000 00	
First mortgage bonds.....	2,600,000 00	
Voucher account .....	5,139 18	
Surplus June 30, 1881.....	17,768 25	
		<hr/> \$5,622,907 43

## ASSETS.

Constructed road.....	\$5,600,000 00	
Cash .....	5,853 01	
C. G. Patterson.....	155 34	
U. S. mail.....	436 05	
Express.....	75 00	
Connotton station.....	170 24	
Dell Roy     "     .....	39 41	
Minerva     "     .....	50	
Robertsville     "     .....	3 72	
Canton     "     .....	139 48	
Middle branch station.....	75	
Valley Railway.. .....	42 92	
Construction account.....	15,991 01	
		<hr/> \$5,622,907 43

*State of Massachusetts, County of Suffolk, ss.:*

Francis Barttue, ——— of the Connotton Valley Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

FRANCIS BARTTUE.

[SEAL OF R.R.]

Subscribed and sworn to before me, this 15th day of October, A. D. 1881.

JAS. B. BELL,

[SEAL].

*Commissioner for the State of Ohio, residing in Boston.*

DAYTON AND MICHIGAN RAILROAD COMPANY, AND CIN-  
CINNATI, HAMILTON AND DAYTON RAILROAD COM-  
PANY OPERATING.

Name of road: Dayton and Michigan Railroad.  
 By whom owned: The Stockholders.  
 By whom operated: Cincinnati, Hamilton and Dayton Railroad Company.  
 By what authority: Lease.  
 Name of company making this report: Dayton and Michigan Railroad Co.  
 General office at Cincinnati, O.  
 Principal office in Ohio at Toledo, O.  
 Address correspondence relating to this report to F. H. Short, Secretary and  
 Treasurer, at Cincinnati, Ohio.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. H. Devereaux .....	President .....	Cleveland .....	.....
John Carlisle.....	Vice President.....	Cincinnati.....	.....
F. H. Short.....	Secretary .....	“ .....	.....
L. Williams.....	Treasurer.....	“ .....	.....
	General Manager .....	“ .....	.....
E. E. Dwight .....	Superintendent .....	Toledo.....	.....
A. H. McLeod .....	General Freight Agent.....	Cincinnati.....	.....
Samuel Stevenson.....	General Ticket Agent ...	“ .....	.....

DIRECTORS.

Name.	Residence.	Name.	Residence.
J. H. Devereaux.....	Cleveland.....	F. H. Short.....	Cincinnati.
S. Burke.....	“ .....	H. D. Huntington.....	“ .....
John Carlisle.....	Cincinnati.....	Lewis Williams.....	“ .....
Martin Bare.....	“ .....	Wm. Beckett.....	Hamilton, O.
M. Shoemaker .....	Toledo .....		

CAPITAL STOCK.

CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$2,402,823 30	
preferred.....	1,211,250 00	
		<hr/>
Total.....		\$3,614,073 30
Number of shares—common.....	48,056	
preferred.....	24,225	
		<hr/>
Total.....		72,281
Par value of each—common.....	\$50 00	
preferred.....	50 00	
Increase since June 30, 1880—common.....		\$44,921
Capital stock authorized by vote of Company—common.....	\$25,000	
preferred.....	37,000	
		<hr/>
Total.....		\$6,200,000 00
Total paid in capital stock—common.....	\$2,402,822 30	
preferred.....	1,211,250 00	
		<hr/>
Total.....		3,614,072 30
Increase since June 30, 1880—common.....		449 21
Average amount paid in per mile of single main track (140.714 miles).		
Proportion of same for Ohio.....		3,614,072 30
Stockholders, residents of Ohio, 338.		
Amount of stock held by them June 30, 1881, \$3,509,827.53.		
Agents authorized to transfer stock : F. H. Short, Secretary, Cincinnati, Ohio.		
Number of shares transferred within the year at such agencies, 17,592.		

FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Am't actually issued.
Bond .....	Mortgage.....	June 10, '56	July 1, '81	7%	\$3,000,000	\$1,846,000
Bond .....	“ .....	July 9, '64	Sept. 1, '84	7%	650,000	426,000
Bond .....	“ .....	Feb. 17, '69	Oct. 1, '88	7%	700,000	351,000
Bond .....	“ .....	July 22, '61	Mch. 1, '81	7%	80,000	52,500
Bond .....	“ .....	Mch. 1, '64	1, '94	7%	100,000	53,000
Total.....					<hr/> \$4,522,000	<hr/> \$2,728,500

Average amount per mile of single main track (140.714 miles).....	\$32,136 05
Proportion of same for Ohio (140.714 miles).....	4,522,000 00

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$565,559	39
All other debts, current credit balances, etc.....	566	00
Total unfunded debt.....	\$564,993	39
Average amount per mile of single main track (140.714 mi.)	\$4,015	19
Proportion of same for Ohio.....	564,993	39
Increase since June 30, 1880.....	23,237	65
Total net debt liabilities.....	3,293,493	39
Average amount per mile of single main track..	\$23,405	58
Proportion of same for Ohio.....	2,293,493	39
Total of paid in stock and debt.....	6,907,565	69
Total average amount per mile .....	\$49,080	40
Proportion of same for Ohio....	6,907,565	69

## COST OF ROAD EQUIPMENT, ETC.

## CONSTRUCTION ACCOUNT.

Total expenditures for construction and real estate: Prior to July 1, 1880, \$6,126,856.80; for the year ending June 30, 1881, \$23,190.87; total expenditures to July 1, 1881, \$6,150,047.67.

Average cost per mile of road constructed (single main track, 140.714 miles).....	\$43,706	02
Average cost per mile of road owned by company (single main track (140.714 miles).....	43,706	02
Proportion of same for Ohio.....	6,150,047	67

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 33; first class passenger cars, 15; box freight cars, 438; platform cars 134; baggage cars, 3; mail and express cars, 1; coal cars, 135; section cars, 26; hand cars, 25; caboose cars, 12; stock cars, 87; wrecking cars, 1. This shows the amount of equipment to date. The cost of each item separately can not be given.

Total cost of railroad equipment owned by company.....	\$776,334	12
Average amount per mile (of single main track, 140.714 miles)....	5,517	10
Proportion for Ohio (140.714 miles) .....	776,334	12
Total for road and equipment .....	6,926,381	79
Total average amount per mile (of single main track, 140.714 miles).....	49,223	12
Proportion of same for Ohio (140.714 miles) .....	6,926,381	79

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cincinnati to Toledo.....	140.714	140.714
Total single main track .....	140.714	140.714
Aggregate of sidings and other tracks .....	23.647	23.647
Total length laid with rail computed as single track.....	164.361	164.361
Laid with steel rail .....	75	75

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Montgomery.....	11.401	2.921	14.322
Miami.....	19.337	3.030	22.367
Shelby.....	20.494	3.441	23.935
Auglaize.....	12.620	.960	13.580
Allen.....	17.607	3.999	21.606
Putnam.....	19.800	1.974	21.774
Henry.....	5.162	.656	5.818
Wood.....	32.077	3.530	35.607
Lucas.....	2.216	3.136	5.352
Total.....	140.714	23.647	164.361

#### GAUGE, GRADE, CURVATURE, RAILS, ETC.

Grade—Maximum, per mile .....	31.1 feet.
Longest maximum .....	78.14 feet.
Aggregate length of maximum.....	117.74 feet.
Curvature—Shortest radius .....	14.32 feet.
Aggregate length of shortest radius.....	42.24 feet.
Aggregate length of all radii.....	520.88 feet.
Aggregate length of tangent.....	129.95 mi.
Rail—Iron—On road, main track, 56.714; side, 23.647.....	89.361 mi.
Average weight per yard, originally .....	60 lbs.
Steel—On road .....	84 mi.
Average weight per yard .....	60 lbs.
Ties—Average number per mile.....	2,640
Ballasted—On whole line .....	140.714 mi.
In Ohio.....	140.714 mi.
With gravel and sand.	

#### BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 17; greatest age, 14 years; aggregate length, 2,276 feet.	
Trestles—16; greatest age, 14 years; greatest height, 26 feet; greatest length, 532 feet; aggregate length, 2,570 feet.	
Length of shortest span of truss, 30 feet; of longest, 165 feet; greatest length of beams between points of support, if not trussed, 24 feet.	
Greatest space between cross ties upon bridges and trestles, 2 inches; length of ties, 10 feet.	
Number of track stringers, 280.	
Are all bridges and trestles provided with guard rails? Yes.	
Do all bridges and trestles receive stated examinations? Yes.	

How often? About every two months.

Are the examinations analytical, and are they made by a competent person? Yes.

#### FENCING—AVERAGE AND AGGREGATE COST.

	Whole line.	In Ohio.
Number miles fencing, computed as single line, once fenced..	281.428	281.428
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.28).		
Wire (average cost per rod, \$1.00) .....	2 miles.	2 miles.

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

P., C & St. L. R'y at Piqua, O.

P., Ft. W. & Chicago R'y at Lima, O.

Baltimore & Ohio R. R. at Deshler, O.

What railroads cross your road either over or under grade in this State, and where?

Columbus & Toledo R. R. at Toledo, O.

Ohio Central R. R. at Toledo, Ohio.

Pennsylvania Company's roads at Toledo, O.

Number of crossings of highways at grade in this State without protection, 226.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 5.

Number of crossings of highways over railroad, 2.

“ “ under railroad, 1.

Number of highway bridges 18 feet above track, none.

Number of highway bridges less than 18 feet above track, none.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated, 142.

Miles of same owned by railroad company, 142.

##### STATIONS.

Passenger and freight, 34.

Number with telegraph communication, 21.

Number of same operated by railroad company, 21.

Is pay received for messages sent over line owned by railroad company? Yes.



## ROLLING STOCK.

Locomotives.....	33; average weight.....	58,220 pounds.
Express and baggage cars .....	4; " .....	26,000 "
Passenger cars.....	15; " .....	35,000 "
Freight cars .....	794; " .....	18,000 "
Other cars.....	13; " .....	17,000 "

Number of locomotives equipped with train brakes, 13.

Kind of brake: Westinghouse air brake.

Number of cars equipped with train brakes, 19.

Kind: Westinghouse air brake.

Number of passenger cars with " Miller Platform," 15.

Method of bridging between passenger cars, when two or more are run in trains:  
Miller platform and buffer.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Wood or coal, part with Baker heaters.

• Means of lighting same: Oil and candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation, " .....	23 "
Freight trains, " .....	10 "

## EMPLOYES.

Superintendents .....	1
Telegraph operators.....	26
Engineers .....	30
Baggagemen .....	9
Flagmen, switch-tenders and watchmen.....	10
Laborers .....	103
Clerks.....	44
Train dispatchers.....	3
Firemen .....	29
Wipers .....	13
Mechanics .....	175
Conductors.....	23
Brakemen .....	49
Station agents .....	28
Section men.....	191
Other employees .....	19

Total number employed by company in operating line .....	743
Proportion for Ohio.....	743

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: United States Express Co.

Terms: \$100 per day for 10,000 lbs. daily average between Cincinnati and Toledo, and 55 cents for excess.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

The figures for this table can only be given on estimates, subject to usage, quality, location, etc.

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—

	Highest.	Lowest.	Average.
For distances less than 8 miles.....	10 Cts.	3 Cts.	Est. 3½ Cts.
For distances over 8 miles—First class.....	3	3	3
Excursion.....	2	Est. ½	Est. 1

Amount charg'd in addition to regular fares in sleep'g or other cars run on your road:

For seat, 50 and 60 cents, according to destination; berth, \$2; section, \$1; state room, \$5.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

	Highest.	Lowest.	Average.
First class .....	10 Cts.	1.5 Cts.	5. Cts.
Second class .....	8.	1.25	4.5
Third class .....	6.	1.	3.5
Fourth class .....	5.	.75	2.5
Fifth class .....	4.	.50	2.
Special class .....	2.5	.40	1.5

Rate per ton per mile on freight carried less than 30 miles:

First class .....	30.	5.17	17.5
Second class .....	30.	4.14	17.
Third class .....	30.	3.45	15.
Fourth class .....	30.	3.1	15.
Fifth class .....	25.	2.76	14.
Special class .....	25.	2.58	13.

Rate per ton per mile on freight carried more than 30 miles:

First class .....	6.13	2.25	4.
Second class .....	5.16	1.75	3.5
Third class .....	3.87	1.50	2.5
Fourth class .....	3.23	1.	2.
Fifth class .....	3.	.75	2.
Special class .....	2.42	.70	1.5

## Rate per ton per mile for—

Coal—Carried ten miles or more.....	.5	.50	1.25
Carried less than ten miles.....	25.	5 $\frac{5}{8}$	10.
Pig iron—Carried 10 miles or more .....	5.	.65	1.50
Carried less than 10 miles .....	25.	5 $\frac{5}{8}$	10.
Limestone—Carried 10 miles or more .....	5.	.65	1.50
Carried less than 10 miles .....	25.	5 $\frac{5}{8}$	10.
Iron ore—Carried 10 miles or more.....	5.	.65	1.50
Carried less than 10 miles.....	25.	5 $\frac{5}{8}$	10.
Undressed stone or lumber—Carried 10 miles or more ...	5.	.75	1.50
Carried less than 10 miles... ..	25.	5 $\frac{5}{8}$	10.

## Rate per 100 lbs. for loading:

First class .....	4.25	3.75	4.
Second class .....	3.	3.	3.
Third class .....	1.50	1.50	1.50
Fourth class .....	1.50	1.50	1.50
Fifth class .....	1.50	1.50	1.50
Special class .....	1.25	1.25	1.25

## Rate per 100 lbs. for unloading:

First class .....	4.25	3.75	4.
Second class .....	3.	3.	3.
Third class .....	1.50	1.50	1.50
Fourth class .....	1.50	1.50	1.50
Fifth class .....	1.50	1.50	1.50
Special class .....	1.25	1.25	1.25

## DOINGS OF THE YEAR ENDING JUNE 30TH.

## Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length—feet.
No. 7, over canal at Troy .....	Howe.....	Wood.....	85
No. 8, over Miami river, Troy .....	“ .....	“ .....	555
No. 17, Ottawa, Blanchard riv. ....	“ .....	“ .....	140

Trestles built in Ohio, 4; aggregate length 358 ft.

Fencing in Ohio—Miles of single fence built: Only repairs.

Rail laid—Steel, 60 pounds per yard, miles of track, 22; in Ohio, 22.

Train mileage—Passenger .....	324,370
Freight .....	407,746
Mixed .....	172,752
Construction .....	40,034

Total .....	944,902
-------------	---------

Car mileage—Passenger.....	873,767	
Express and baggage.....	310,676	
Freight—loaded.....	7,319,516	
empty.....	1,882,182	
Caboose .....	372,559	
<b>Total.....</b>		10,958,700
Fuel consumed—Wood, 3,587 cords; coal, 29,431½ tons; total cost.....		\$77,513 67
Losses, etc., paid—On goods and baggage.....		6,847 46
For injuries in Ohio, fatal and non-fatal— to employes .....		843 10
For animals killed in Ohio:		
Horses, 2.....	\$150 00	
Cattle, 14.....	62 50	
<b>Total.....</b>		\$212 50

## TRANSPORTATION.

Passengers—Number carried, local.....	392,673	
through .....	19,543	
<b>Total.....</b>		412,216
Average number carried in each car per trip .....		4,180
Average number of miles traveled by each .....		2,996
Total mileage, or number carried one mile .....		12,349,601
Average amount received for each.....		75.58c.
Average amount <i>per mile</i> received for each .....		2.523c.
Freight—Tons, carried—local .....	621,385	
through.....	141,863	
<b>Total.....</b>		763,198
Average tons in each loaded car per trip.....		6.02
“ “ “ mile .....		1.014
Total movement, or tons carried one mile .....		74,152,597
Average amount received for each ton .....		1.5c.
“ amount <i>per mile</i> received for each ton .....		1.5c.
“ cost per ton of freight: Have no way of ascertaining.		
“ amount received for each ton through freight.....		101.6
“ amount received for each ton local freight.....		105.7
“ cost each ton through freight: No way of ascertaining.		
“ “ local “ “		
Articles transported :	Tons.	Per cent.
Coal .....	46,179	6.05
Stone, lime, sand, etc.....	56,432	7.39
Petroleum .....	2,734	.35
Ores.....	426	.06
Pig and bloom iron.....	21,269	2.78

Manufactured iron .....	6,963	.92
Lumber and other forest products .....	238,591	31.26
Grain, flour, and other agricultural products .....	232,834	30.51
Live stock .....	18,140	2.37
Animal products.....	8,629	1.14
Manufactures, including agricultural implements.....	15,652	2.05
Merchandise.....	106,483	13.96
Miscellaneous.....	8,866	1.16
Total tonnage yielding revenue .....	763,198	100.
Supplies for company's use .....	23,668	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

### EARNINGS.

Passenger transportation—local .....	\$262,955	29
through.....	48,010	14
Total.....		\$311,565 43
Freight transportation—local.....	\$656,581	37
through.....	144,139	41
Total.....		800,720 78
Mail service.....		18,700 70
Express service.....		26,244 55
Other sources.....		6,243 12
Total earnings of line operated included in this report.....		\$1,179,734 25

OPERATING EXPENSES.

Maintenance of way and structures .....	\$276,908	10
Maintenance of cars .....	102,332	82
Motive power.....	200,306	66
Conducting transportation .....	153,657	37
General expenses :		
Taxes in Ohio.....	39,243	07
Salaries .....	21,749	09
Other general expenses of operating.....	30,408	05
	<u>91,400</u>	<u>21</u>
Total operating expenses, being 69 86 per cent. of earnings .....	\$824,605	16
Net earnings of 142 miles operated.....	\$355,129	09
Rentals paid for use of road, track, depots, equipment, etc. :		
Lake Shore & Michigan Southern R. R.....	12,900	00
Net income over operating expenses and rents paid.....	\$342,229	09
Percentage of same to capital stock and debt, 4.95.		
Percentage of to total means applied to construction, etc., 4.94.		

Per mile of earnings, 142 miles; proportion for Ohio, \$8,307 98 .....	1,179,734 25
operating expenses; " 5,807 08 .....	824,605 16
net earnings; " 2,500 96 .....	355,129 09

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt—C., H. & D. R. R., lessee .....	\$23,045 65
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$190,086 03
Premiums and commissions for paying coupons .....	357 07
Dividends, rate 3½ per cent. on general stock .....	36,002 74
Last dividend declared on general stock: Apr. 1, 1881.	
Dividends, rate 8 per cent. on preferred stock .....	96,900 00
Last dividend declared on preferred stock: Apr. 1, 1881.	
Construction of new work .....	22,690 87
Additional real estate .....	500 00
	<hr/>
	\$346,536 71

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock—common .....	\$2,402,822 30
Capital stock—preferred .....	1,211,250 00
First mortgage .....	1,846,000 00
Second mortgage .....	426,000 00
Third mortgage .....	351,000 00
Toledo depot—1st mortgage.....	52,500 00
Toledo depot—2d mortgage .....	53,000 00
Income bonds .....	300 00
C., H. & D. R. R., lessee, \$542,213.74.....	565,259 39
Profit and loss.....	18,816 10
	<hr/>
	\$6,926,947 79

## ASSETS.

Construction.....	\$5,743,284 14
Right-of-way.....	109,661 05
Rolling stock .....	776,334 12
Real estate .....	297,102 48
Railroad and individual account.....	566 00
	<hr/>
	\$6,926,947 79

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880.				
1	July 21	James Fee.....	Brakeman...	Coupling cars.....	Body crushed.
2	22	T. Chambers..	Switchman...	" ".....	Arm crushed.
3	29	Christ. Singer..	Brakeman...	" ".....	Head crushed and scalp.
4	Aug. 28	W. B. Cornell..	" ".....	Climbing on cars.....	Foot run over; pinched.
5	28	Jas. Webb.....	" ".....	Coupling cars.....	Arm bruised.
6	Sept. 25	Fred'k Brach..	" ".....	" ".....	Hand badly smashed.
7	30	Mrs. Bowman..	Passenger...	Jumped from train.....	Slightly bruised.
8	Oct. 6	Jno. Andrews..	Brakeman...	Coupling cars.....	Elbow pinched.
9	7	J. Neiderkora	Boy 12 yrs...	Foot caught & thrown down	Foot bruised.
10	7	Unkn'w'n man	" ".....	Unknown.....	Found on track crushed.
11	Nov. 20	John Walsh...	Switchman...	Coupling cars.....	Hip pinched.
12	22	M. Hart.....	" ".....	" ".....	Thumb and finger crushed.
13	Dec. 11	Thos. Bell.....	Foreman.....	" ".....	Finger mashed.
14	22	Unkn'w'n man	" ".....	Lying on track.....	Cut in two.
	1881.				
15	April 5	E. M. Botkins..	Brakeman...	Coupling cars.....	Hand bruised.
16	7	— Black.....	Boy 12 yrs...	Jumped from train.....	Bruised.
17	11	Thos. O'Kerpe	" ".....	Fell from abutment.....	Badly bruised.
18	June 10	Frank Hart....	Boy.....	Lying on track in fit.....	Mangled and killed.
19	18	Jno. Berman..	Fireman.....	Jumped from train; 2d car fell on him.....	Crushed.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Others—Getting on or off engine or train in motion.....	1
Lying, walking, falling, or being on track.....	2
Employees—Engine or train leaving or thrown from track.....	1
Coupling, or crushed between cars and engine.....	1
Miscellaneous.....	1
Total.....	6

## PERSONS INJURED—CAUSES.

Passengers—Getting on or off engine or train in motion.....	1
Employees— " " " ".....	1
Coupling, or caught between cars and engine.....	9
Miscellaneous.....	2
Total.....	13

## RECAPITULATION.

Killed—Employees—from misconduct or want of caution.....	2
Others—trespassing, on track, etc.....	4
Total killed.....	6
Injured—Passengers—from misconduct or want of caution.....	1
Employees—misconduct or want of caution.....	10
Others—trespassing on track, etc.....	2
Total injured.....	13



## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880.				
2	July 26	Toledo.....	Engine.....	Switch open.....	Engine derailed.
3	Sept. 2	".....	Engine and car.	Loose bridge timber.....	Car damaged.
4	1881.				
5	Jan. 4	Lima.....	Freight.....	Broken rail.....	Cars derailed.
6	14	Cairo.....	Mixed.....	".....	".....
7	18	Belmore.....	Passenger.....	".....	".....
8	25	Wapakoneta.....	Freight.....	".....	".....
9	28	Dayton.....	Engine.....	Collision.....	Engine damaged.
10	Mar. 14	Lima.....	Switch.....	".....	".....
11	April 1	Belmore.....	Freight.....	Broken rail.....	Cars derailed.
12	June 18	Tadmire.....	".....	Cow on track.....	Engine and cars derailed.
13	27	Dayton.....	Passenger.....	Run into.....	Engine damaged.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	8
Accidents not resulting in derailment of train.....	3
Collisions—butting.....	2
Total accidents.....	11

## Causes of accidents effecting derailment of trains:

Broken rail.....	6
Cattle on track.....	1
Misplaced switch.....	1
Total.....	8

## Causes of collisions:

Misplaced switch.....	1
Running carelessly.....	1
Total.....	2

## Causes of accidents not resulting in derailment of trains:

Accidental obstruction.....	1
Total collisions.....	8
Total accidents.....	2
Total.....	11

State of Ohio, county of Cuyahoga, ss.:

Lewis Williams, General Manager of the Dayton and Michigan Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

LEWIS WILLIAMS,  
General Manager.

Subscribed and sworn to before me, this 30th day of August, A. D. 1881.

[SEAL.]

J. T. WANN,  
Notary Public.

# RECEIVER OF DAYTON AND SOUTHEASTERN RAILWAY, FROM JUNE 30, 1880, TO MAY 21, 1881.

Name of road: Dayton and Southeastern Railroad.  
 By whom owned: Same railroad company.  
 By whom operated: Receiver J. E. Gimperling.  
 By what authority: Superior Court, Montgomery county, Ohio.  
 Name of person making this report: F. Sprague, late Auditor for the Receiver.  
 Address correspondence relating to this report to F. Sprague, Auditor of T.,  
 D. & B. Railroad, at Toledo, Ohio.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Dayton and Southeastern Railroad Company was consolidated with the Toledo, Delphos and Burlington Railroad Company in March, 1881, the new organization taking the name of the Toledo, Delphos and Burlington Railroad Company; but the company's property being at the same time in possession of a receiver, possession was not given to the new company until May 22, 1881. up to which date this report is made, showing the operations for ten months and twenty-one days.

## DOINGS OF THE YEAR TO MAY 21, 1881.

Train mileage—Passenger .....	1,329	
Freight .....	52,231	
Mixed .....	138,587	
Construction .....	20,897	
Total.....		213,044
Car mileage—Passenger ....	237,020	
Express and baggage .....	75,953	
Freight—loaded.....	1,301,990	
empty.....	907,570	
Construction and other.....	88,564	
Total.....		2,611,097
Fuel consumed—Coal, 7,880 tons; total cost.....		\$9,950 12
Losses, etc., paid—On goods and baggage.....		428 85
For injuries in Ohio, fatal and non-fatal:		
to employees .....		1,131 50
For animals killed in Ohio.....		534 00

## TRANSPORTATION.

Passengers—Number carried (10½ months) .....	84,096
Average number carried in each car per trip .....	27
Average number of miles traveled by each .....	20½
Total mileage, or number carried one mile .....	1,715,574
Average amount received for each .....	44½ c.
Average amount <i>per mile</i> received for each .....	2.18 c.
Freight—Tons carried.....	145,393
Average tons in each loaded car per mile .....	7.070
Total movement, or tons carried one mile .....	9,206,291
Average amount received for each ton.....	96 c.
Average amount <i>per mile</i> received for each ton .....	1.52 c.
Average cost per ton freight per mile.....	1.14 c.
Average cost each ton local freight .....	72 c.

## Articles transported :

	Tons.	Per cent.
Coal .....	80,306	55.2
Stone, lime, sand, etc .....	1,814	1.2
Petroleum.....	49	.1
Ores .....	914	.6
Pig and bloom iron .....	3,802	2.6
Manufactured iron.....	119	.1
Lumber and other forest products .....	12,819	8.8
Grain, flour, and other agricultural products .....	22,579	15.5
Live stock.....	7,456	5.1
Animal products .....	694	.5
Manufactures, including agricultural implements.....	736	.5
Merchandise .....	14,067	9.7
Miscellaneous .....	41	.1
<hr/>		
Total tonnage yielding revenue. ....	145,396	100
Supplies for company's use .....	5,489	

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30

## EARNINGS—10 MONTHS AND 21 DAYS.

Passenger transportation.....	\$37,409 03
Freight transportation.....	139,969 35
Mail service .....	4,965 86
Express service .....	1,145 81
Other sources .....	867 51
<hr/>	
Total earnings of line operated included in this report.....	\$184,357 56

## OPERATING EXPENSES—10 MONTHS AND 21 DAYS.

Maintenance of way and structures....	\$32,450 50	
Maintenance of cars .....	6,115 03	
Motive power .....	41,099 05	
Conducting transportation.....	38,285 51	
General expenses, as follows:		
Taxes in Ohio.....	\$5,364 56	
Salaries.....	8,070 51	
Other general expenses of operating.....	2,127 04	
	<u>15,552 11</u>	
Total operating expenses, being 72.4 per cent of earnings.....		\$133,502 20
Net earnings of 115 miles operated .....		50,855 36
Rentals paid for use of road, track, depots, equipment, etc.....		6,001 85
Net income over operating expenses and rents paid .....		44,853 51
Per mile of earnings per annum .....		1,799 42
operating expenses per annum .....		1,305 92
net earnings per annum.....		493 50

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt of Receiver.....	\$337,640 14
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds—net.....	\$22,323 00	
Interest on floating debt of Receiver.....	13,648 42	
Interest on Receiver's certificates.....	12,439 35	
Receiver's certificates redeemed .....	178 250 00	
Floating debt liquidated—company .....	19,185 21	
Increase of Receiver's construction account.....	122,438 36	
Decrease of company's construction account .....	11,574 37	
Decrease of company's surplus earnings.....	1,935 35	
Decrease of capital stock .....	699 59	
	<u>\$382,493 65</u>	
Balance from Receiver's income account .....		\$48,853 51

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock subscribed .....	\$640,400 00	
Less amount unpaid .....	147,462 53	
	<u>\$492,937 47</u>	
Represented by stock paid up and issued .....	\$473,850 00	
partially paid .....	19,087 47	
First mortgage bonds .....	600,000 00	
Receiver's certificates.....	1,750 00	
	<u>601,750 00</u>	

Company's floating debt .....	\$35,580 37	
Receiver's floating debt .....	429,146 47	
		<hr/> 464,726 84
Unpaid interest on Receiver's certificates .....	\$171 15	
Unpaid interest on 1st mortgage bonds .....	6,037 50	
		<hr/> 6,028 65
Company's surplus earnings .....	\$13,730 35	
Receiver's surplus earnings .....	71,653 48	
		<hr/> 85,383 83
Total .....		<hr/> \$1,651,006 79

## ASSETS.

Construction account—Company .....	\$1,014,560 78	
Construction account—Receiver .....	506,850 00	
		<hr/> \$1,521,410 78
Accrued interest on 1st mortgage bonds .....		127,586 41
Accounts receivable of company .....	\$541 56	
Accounts receivable of Receiver .....	1,468 04	
		<hr/> 2,009 60
Total .....		<hr/> \$1,651,006 79

*State of Ohio, County of Montgomery, ss.:*

F. Sprague, late Auditor of the Dayton and South Eastern Railroad, and now Auditor of the Toledo, Delphos and Burlington R. R. Co., its successor, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

F. SPRAGUE.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 14th day of November, A. D. 1881.

[SEAL]

P. A. MACGAHAN,

*Notary Public, Lucas County, O.*

## DAYTON AND UNION RAILROAD COMPANY.

Name of road: Dayton and Union Railr. ad.

By whom owned: Dayton and Union Railroad Company.

By whom operated: Dayton and Union Railroad Company.

By what authority: Stock ownership.

Name of person making this report: John L. Miller, Auditor and Secretary  
Dayton and Union Railroad Company.

General office at Dayton, Ohio.

Principal office in Ohio at Dayton, Ohio.

Address correspondence relating to this report to John L. Miller, Auditor, at  
Dayton, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

This road was originally the Greenville and Miami Railroad. The main line from Dodson to Union City, Ind. (32 miles), was completed and put in operation in 1852. The track from Dayton to Dodson (15 miles) was completed in August, 1854, making 47 miles of main line. Subsequently the road was sold under foreclosure of the first mortgage bonds (\$150,000), and recapitalized (under an act of the Legislature) February, 1862, and the name changed to the Dayton and Union Railroad Company. In December, 1862, the track between Dayton and Dodson (15 miles) was abandoned (this company reserving the right of way). The iron chairs, spikes, etc., were sold, and the proceeds applied to the liquidation of \$90,000 of the second mortgage bonds of the company. On the first of January, 1863, the company leased from the Dayton and Western Railroad Company the right to use its track between Dayton and Dodson at an annual rental of \$10,000. Since the 23d of December, 1871, this road has been operated under trustees.

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Jas. McDaniel.....	Dayton, O .....	L. Williams.....	Cincinnati, O.
G. W. Rogers.....	" .....	J. H. Devereux.....	Cleveland, O.
P. Smith.....	" .....	H. B. Hurlbut .....	"
F. H. Short.....	Cincinnati, O.....	H. H. Poppleton.. ..	"
John Carlisle.....	" .....		

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
James McDaniel.....	President .....	Dayton, O.....	\$500
John L. Miller.....	Secretary .....	" .....	
G. W. Rogers.....	Treasurer .....	" .....	
John L. Miller.....	Auditor.....	" .....	1,800
C. C. Gale.....	General Superintendent...	Indianapolis.....	900
Edgar Hill.....	General Freight Agent....	Cleveland, O.....	
John L. Miller.....	General Ticket Agent .....	Dayton, O .....	
Jas. McDaniel .....	} Executive Committee {	.....	
C. C. Gale.....		.....	
Percival Smith .....		.....	
Total salary .....			\$3,200

## CAPITAL STOCK.

Capital stock authorized by law	Amount—common *	\$86,300 00
	No. shares—common .....	1,726
	Par value of each—common	\$50
Total paid in capital stock—common.....		86,300 00
Average amount paid in per mile of single main track, 31.74 miles .....		2,718 99
Proportion of same for Ohio, 31.74 miles .....		All.

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

In exchange for G. M. stock and bonds—No. shares, 1,726; amount of common, \$1,309; amount of preferred, \$417.		
Stockholders, residents of Ohio.....		17
Amount of stock held by them June 30, 1881.....		\$76,400 00
Agents authorized to transfer stock: John L. Miller, Secretary, Dayton, O.		
Number of shares transferred within the year at such agencies, 661.		

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage....	Deed of trust....	Dec. 1, 1879	Dec. 1, 1909.....	6	\$325,000 00	225,000 00
Income.....	" .....	" 1, 1879	" 1910.....	7	225,000 00	225,000 00
Old scrip*	.....	1862	.....			1,444 88
Total.....						451,444 88

\*Have never been presented for payment.

Average amount per mile of single main track (31.74 miles) .....	\$14,223 21
Proportion of same for Ohio, all.	
Decrease since June 30, 1880—bonds canceled.....	6,000 00

\* The preferred stock has been consolidated with the common stock since last report.



## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$15,359 50
Cash securities, debit balances, etc., available to payment.....	24,552 80

## COST OF ROAD EQUIPMENT, ETC.

## CONSTRUCTION ACCOUNT.

The original cost of the Greenville and Miami Railroad to foreclosure and sale, as nearly as can be ascertained, was as follows:

Construction.....	\$622,688 97
Right-of-way.....	6,351 76
Depots .....	7,089 67
Engineering and superintendence.....	9,295 34
Real estate.....	2,100 00
Equipment .....	123,731 63
	<hr/> \$771,257 37

The total cost of the D. and U. R. R., as represented in balance sheet, is.. 623,336 02

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Dodson to Union.....	31.74 miles.	31.74 miles.
Aggregate of sidings and other tracks.....	1.78	1.78

Total length laid with rail computed as single track... 32.52 32.52

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Montgomery .....	3.953	.034	3.987
Preble .....	1.508	.235	1.743
Darke.....	2.6279	1.511	27.790
Totals .....	31.740	1.780	33.520

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
P. C. & St. L. R'y (Dayton and Western) Dayton to Dodson.....	15 miles.	15 miles.

## CHARACTERISTICS, Etc.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 10 inches.
Rail—Iron—On road—Average weight per yard.....	56 pounds.
Steel—On road .....	31.74 miles.

Ties—Number laid during the year.....	14,958
Ballasted—On whole line .....	31.74 miles.
In Ohio.....	31.74 “
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 1; greatest age, 2 years; aggregate length, 142 feet.	
Trestles—55; greatest age, 13½ years; greatest height, 10 feet; greatest length, 30.	
Length of shortest span of truss, 40 ft.; of longest, 46 feet.	
Greatest space between cross ties upon bridges and trestles, 12 inches;	
length of ties, 8 feet 6 inches	
Number of track stringers, 20.	
Are all bridges and trestles provided with guard rails? No.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Every three months.	
Are the examinations analytical, and are they made by a competent person? By Superintendent of bridges.	

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?	
C., C. & I. C. (P., C. & St. L.) Railway at Greenville, Ohio.	
Number of crossings of highways at grade in this State at which there are gates or flagmen, 2.	
Do all trains stop at railroad crossings as required by law? Yes.	
Are flagmen stationed at each? Not all.	

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated in Ohio.....	46.74
---	-------

## STATIONS.

Passenger and freight, in Ohio.....	15
Number with telegraph communication in Ohio.....	5
Number of same operated by railroad company, in Ohio.....	5

## ROLLING STOCK.

Locomotives, 4; average weight.....	60,000 lbs.
Express and baggage cars, 2; average weight.....	29,000 “
Passenger cars, 3; average weight.....	36,000 “
Freight cars, 48.	

Above includes not owned by company reporting.

Locomotives owned by C., C., C. & I. Railway Company, 1.

Terms of service: For use of locomotives,  $3\frac{1}{2}$  cents per mile; first class coaches, 3 cents per mile; second class and baggage,  $1\frac{1}{2}$  cents per mile; freight cars  $\frac{3}{4}$  cent per mile.

Number of locomotives equipped with train brakes, 2.

Kind of brake: Westinghouse Air.

Number of cars equipped with train brakes, 3.

Kind: Westinghouse Air.

Number of passenger cars with "Miller Platform," 3.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Winslow Safety Stove.

Means of lighting same: Use candles fully protected.

#### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation, .....	12 "
Freight trains, .....	10 "

#### EMPLOYEES.

Superintendents .....	1
Telegraph operators .....	3
Engineers .....	4
Baggagemen.....	1
Flagmen, switch-tenders and watchmen .....	3
Clerks .....	1
Train dispatchers.....	1
Firemen .....	4
Wipers.....	4
Mechanics .....	2
Conductors .....	2
Brakemen .....	4
Station agents .....	15
Section men.....	37
Other employees.....	10
<hr/>	
Total number employed by company in operating line.....	92
Proportion for Ohio. ....	92

#### EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: United States.

Terms: 25 cents per 100 lbs. for all distances, and half fare for messages.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles	10 Cts.	3 Cts.	6½ Cts.
For distances over 8 miles—First class.....	3	2	2½
Second class.....	2½	2	2¼
Emigrant.....	2½	2	2¼
Excursion.....	2	½	1¼

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

First class.....	1.428	.425	.926
Second class .....	1.148	.361	.752
Third class.....	1.000	.255	.627
Fourth class.....	.857	.212	.534
Fifth class.....	.714	.170	.442
Special class.....	.571	.149	.360

Rate per ton per mile on freight carried less than 30 miles :

First class .....	10.66	.....	.....
Second class.....	8.00	.....	.....
Third class .....	6.00	.....	.....
Fourth class.....	5.33	.....	.....
Fifth class.....	4.66	.....	.....
Special class.....	2.66	.....	.....

Rate per ton per mile on freight carried more than 30 miles :

First class .....	10.266	.....	.....
Second class.....	8.000	.....	.....
Third class .....	6.000	.....	.....
Fourth class.....	5.33	.....	.....
Fifth class.....	4.66	.....	.....
Special class.....	2.66	.....	.....

Rate per ton per mile for—

Coal—Carried ten miles or more.....	1.595	1.000	.....
Carried less than ten miles.....	1.000	1.314	.....
Pig iron—Carried ten miles or more.....	2.659	1.000	.....
Carried less than ten miles.....	8.000	1.314	.....
Limestone—Carried ten miles or more.....	2.659	1.000	.....
Carried less than ten miles .....	8.000	1.314	.....
Iron ore—Carried ten miles or more .....	2.659	1.000	.....
Carried less than ten miles .....	8.000	1.314	.....
Undressed stone or lumber—			
Carried ten miles or more.....	2.659	1.000	.....
Carried less than ten miles.....	8.000	1.314	.....

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Rail laid—Rerolled iron, 151,460 tons.

Train Mileage—Passenger ..	67,680	
Freight .....	3,765	
Mixed .....	33,840	
Total.....		105,285
Car Mileage—Passenger .....	175,720	
Express and baggage .....	36,598	
Freight—loaded.....	342,490	
empty .....	141,703	
Total .....		696,511
Fuel consumed—Wood, 153 cords; coal, 2,563 tons. Total cost .....		\$6,381 44
Losses, etc., paid—On goods and baggage.....		87 86
For animals killed in Ohio: 1 horse .....	\$25 40	
2 cattle.....	32 50	
Total.....		\$57 50

## TRANSPORTATION.

Passengers—Number carried, local .....	87,398	
through.....	16,323	
Total .....		103,721
Average number carried in each car per trip .....		29
Average number of miles traveled by each.....		22.713
Total mileage, or number carried one mile.....		2,355,847
Average amount received for each.....		58.325 cts.
Average amount <i>per mile</i> received for each .....		2.568 cts.
Freight—Tons carried, local.....	50,516	
through.....	22,019	
Total .....		72,535
Average tons in each loaded car per trip.....		10
Average tons in each loaded car per mile .....		10
Total movement, or tons carried one mile.....		2,930,711
Average amount received for each ton.....		98.966 cts.
Average amount <i>per mile</i> received for each ton .....		2.449 cts.
Average amount received for each ton through freight.....		85.819 cts.
Average amount received for each ton local freight.....		1.04 cts.

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local.....	\$44,196 55	
through.....	16,298 46	
Total.....		\$60,495 01



## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock.....	\$86,300 00	
Bond account, first mortgage.....	\$225,000 00	
Income bonds.....	220,000 00	
		445,000 00
Income bonds, scrip .....	1,444 88	
Income account (including supplies).....	188,615 31	
Incidental .....	3,074 89	
Pay-roll.....	2,772 70	
Individual accounts .....	1,068 93	
Due railroads .....	11,517 87	
Interest account.....	603 63	
		\$740,398 21

## ASSETS.

Road equipment and real estate.....	\$623,363 02	
Interest on bonds .....	28,845 00	
Car service.....	1,590 47	
Expense account.....	62,073 93	
Wood.....	999 97	
Due from P. O. Department.....	558 28	
Shop stock.....	769 24	
Agents' balances.....	2,280 68	
Cash on hand .....	19,944 63	
		\$740,398 21

*State of Ohio, County of Montgomery, ss. :*

James McDaniel, President of the Dayton and Union Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

JAMES MCDANIEL,

*Pres't D. & U. R. R.*

Subscribed and sworn to before me, this 16th day of December, A.D. 1881.

[SEAL.]

FRANK CONOVER,

*Notary Public, Montgomery Co., O.*



## EASTERN OHIO RAILROAD.

Name of road: Eastern Ohio Railroad.

By whom owned: W. H. & C. B. Stevens.

By whom operated: W. H. & C. B. Stevens.

By what authority: By purchase.

Name of person making this report: W. H. Stevens.

General office at Cumberland, Ohio.

Address correspondence relating to this report to W. H. Stevens, Cumberland, O

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

This road is owned and controlled as in former reports. We have contracted for the sale of the road to the B., B., V. & S. Company, who contemplate building the road east to Bellaire, and west to Shawnee. They are at this time at work on the extension.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. H. Stevens.....	General Superintendent...	Cumberland, O.....	.....
C. B. Stevens.....	Assistant " ...	" .....	.....

### COST OF ROAD EQUIPMENT, ETC.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1, 1881.
Civil engineering, salaries, etc.....	\$50	.....	\$50
Grading and masonry.....	3,000	.....	3,000
Bridges .....	3,005	.....	3,005
Timber and ties .....	7,990	\$408	8,398
Iron rails, chairs and spikes.....	37,000	.....	37,000
Passenger and freight stations .....	500	.....	500
Engine and car houses.....	200	.....	200
Contingent expenses .....	900	.....	900
Total expenditures for construction.....	\$52,645	\$408	\$53,053

## COST OF EQUIPMENT OWNED BY COMPANY.

1 locomotive.....	\$8,000 00
1 first-class passenger car.....	2,500 00
1 baggage car and way.....	600 00

Total cost of railroad equipment owned by company..... \$11,100 00

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—Cumberland to Point Pleasant.....	7.75 miles.	All.
Aggregate of sidings and other tracks.....	.05 “	“

Total length laid with rail computed as single track..... 7.80 “

Length in Ohio, distributed as follows:

Guernsey county, main track, 7.75 miles; sidings, etc., .05 miles.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge, 4 feet 8½ in.

Rail—Iron—On road..... 7.80 miles.

Average weight per yard ..... 45 lbs.

Ties—Average number per mile..... 2,500

Number laid during the year..... 900

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 9; greatest age, 7 years; length, 600 feet.

Greatest space between cross ties upon bridges and trestles, 20 inches; length of ties, 8 feet.

Do all bridges and trestles receive stated examinations? Yes.

How often? Each week.

Are the examinations analytical, and are they made by a competent person? By competent person.

## STATIONS.

Passenger and freight..... 1

## ROLLING STOCK.

Locomotives, 1; weight, 40,000 lbs.

Passenger cars, 1; weight, 18,000 lbs.

Freight cars—weight, 16,000 lbs.

Kind of brake: Friction brake.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for transportation of passengers: Passenger car heated by coal stove.

Means of lighting same: Sperm candles.

## SPEED OF TRAINS.

Trains are mixed—Speed, 15 miles per hour.

## EMPLOYEES.

Engineers.....	1
Laborers.....	4
Firemen .....	1
<hr/>	
Total number employed by company in operating line.....	6

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: No company has charge of express business on our road. We handle all express matter and charge for it about as we would for freight, making no way bill for less than 25 cents.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles.....	5c.	3c.	4c.

## FREIGHT.

Don't classify our freight business. Try to make our freight bring us about 8 cents per 100 pounds.

## DOINGS OF THE YEAR ENDING JUNE 30.

Total car mileage, 300.

Fuel consumed—Coal, about 200 tons.

## TRANSPORTATION.

Articles transported:

	Tons.
Coal .....	200
Stone, lime, sand, etc. ....	960
Manufactured iron.....	65
Lumber and other forest products.....	75
Grain, flour, and other agricultural products .....	800
Live stock.....	1,065
Animal products.....	91
Miscellaneous ..	890
<hr/>	
Total tonnage yielding revenue.....	4,146

EARNINGS, OPERATING EXPENSES Etc., FOR YEAR ENDING JUNE 30TH.

EARNINGS.

Passenger transportation—total.....	\$2,964 26
Freight transportation—total.....	4,518 64
Mail service .....	392 00
Express service .....	294 60
<hr/>	
Total earnings of line operated included in this report.....	\$8,169 50

OPERATING EXPENSES.

Maintenance of way and structures.....	\$963 25
Motive power .....	450 00
General expenses:	
Taxes in Ohio .....	130 00
Salaries .....	400 00

*State of Ohio, County of Guernsey, ss.:*

W. H. Stevens, General Superintendent of the Eastern Ohio Railroad, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

W. H. STEVENS,

*Gen. Supt.*

Subscribed and sworn to before me, this 14th day of November, A. D. 1881.

[SEAL.]

J. R. KNOWLTON,

*Notary Public for Guernsey county, O.*

## HARRISON BRANCH RAILROAD COMPANY.

Name of road: Harrison Branch Railroad.

By whom operated: Cincinnati, Indianapolis, St. Louis and Chicago Railway Company.

By what authority: Temporary agreement with stockholders.

Name of Company making this report: Cincinnati, Indianapolis, St. Louis and Chicago Railway Company.

General office at Cincinnati, Ohio.

Principal office in Ohio at Cincinnati, Ohio.

Address correspondence relating to this report to E. F. Osborn, Secretary C., I., St. L. & C. R'y Co., at Cincinnati, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Operated under temporary arrangement for 7 per cent. on stock. It being a very short piece of road, no separate account of earnings and expenses are kept. The Cincinnati, Indianapolis, St. Louis and Chicago Railway Company set aside from its gross earnings the requisite amount for payment of 7 per cent. on \$200,000 of its Harrison Branch stock, which is about equal to the estimated net earnings. No books or accounts of the Harrison Branch Company are kept. The questions unanswered in this report are embraced in the report made by the Cincinnati, Indianapolis, St. Louis and Chicago Railway Company.

### NAME, TITLE, AND ADDRESS OF OFFICERS OF COMPANY OPERATING.

Name.	Office.	Address.	Salary.
M. E. Ingalls.....	President.....	.....	.....
E. F. Osborn.....	Secretary .....	.....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
M. E. Ingalls.....	Cincinnati .....	Seth Evans.....	Cincinnati.
Geo. Hoadly.....	" .....	W. N. King .....	" .....
E. F. Orsborn.....	" .....	G. W. Bender .....	Indianapolis.
E. V. Cherry.....	" .....		

## CAPITAL STOCK.

Capital stock authorized by law—Amount—common.....	\$200,000 00
Number of shares—common.....	4,000
Par value of each—common.....	\$50 00
Capital stock authorized by vote of company—common.....	200,000 00
Amount subscribed—common.....	200,000 00
Total paid in capital stock—common.....	200,000 00
Average amount paid in per mile of single main track (7.75 miles).....	25,806 45
Proportion of same for Ohio (7.01 miles) .....	180,903 21
Capital stock issued, and on what account: Cannot classify.	

Number shares, 4,000; amount of common, \$200,000; amount of preferred, none.

Stockholders, residents of Ohio, 17.

Amount of stock held by them June 30, 1881, \$190,150.

Agents authorized to transfer stock: E. F. Osborn, Secretary, Cincinnati, Ohio.

## FUNDED DEBT.

No debt.

## COST OF ROAD EQUIPMENT, Etc.

Construction account: We have no means of knowing the actual cost of construction. Value is represented by amount of capital stock, viz., \$200,000.

## COST OF EQUIPMENT OWNED BY COMPANY.

Has no equipment.

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Valley Junction, O., to Harrison Ohio.....	7.75 miles.	7.01 miles.
Total single main track.....	7.75	7.01
Aggregate of sidings and other tr cks.....	.34	.34
Total length laid with rail computed as single track..	8.09	7.35

Length in Ohio, distributed as follows:

Hamilton county, main track, 7.01; sidings, etc., .34; total, 7.35.

Steel rails: None.

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—1; greatest age, 2 years; aggregate length, 230 ft.

Trestles—2; greatest age, 4 years; greatest height, 15 feet; greatest length, 25 ft.

Length of shortest span of truss, 16 feet; of longest, 16 feet; greatest length of beams between points of support, if not trussed, 16 feet.

Greatest space between cross ties upon bridges and trestles, 4 inches; length of ties, 9 feet.

Number of track stringers, 2.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Four times each year.

Are the examinations analytical, and are they made by a competent person? Yes.

#### FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line: Substantially all fenced when required.

#### CROSSINGS.

Number of crossings of highways at grade in this State without protection, 10.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated..... 7.75, in Ohio,

##### STATIONS.

Passenger and freight..... 2, in Ohio.

Number with telegraph communication..... 2, “

Is pay received for messages sent over line owned by railroad company? No.

##### SPEED OF TRAINS.

Mail and accommodation..... 22 miles per hour.

Freight trains..... 12 “ “

#### EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American Express Company.

Terms: Under contract with Cincinnati, Indianapolis, St. Louis and Chicago Railway Company.

#### DOINGS OF THE YEAR ENDING JUNE 30.

Ballasting—Ballast kept good with gravel entire line.

*State of Ohio, County of Hamilton, ss.:*

M. E. Ingalls, President of the Harrison Branch Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

M. E. INGALLS.

[SEAL OF R. R.]

Subscribed and sworn to before me this 31st day of August, A. D. 1881.

[SEAL.]

JAMES B. WATSON,  
Notary Public of Hamilton County, Ohio.



## IRON RAILROAD COMPANY.

Name of road: Iron Railroad.

By whom owned: Iron Railroad Company.

By whom operated: Iron Railroad Company.

By what authority: Charter of 1848.

Name of person making this report: C. C. Clarke, Secretary Iron Railroad Co.

General office at Ironton, Ohio.

Principal office in Ohio at Ironton.

Address correspondence relating to this report to C. C. Clarke, Manager, Ironton, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

This company was chartered March 17th, 1849, under the name of Iron Railroad Company, with the authority to construct a railroad from a point on the Ohio River, in Lawrence county, Ohio, to the South line of Jackson county; capital stock, \$500,000.

The only part of the road built under this charter extends from Ironton to Centre Station,  $12\frac{3}{4}$  miles; all in Lawrence county completed in 1853.

The following named branches have been built since, viz.:

Hecla Branch, 2 miles, completed 1873.

Etna        "        "        "        "

Texas      "         $1\frac{1}{4}$         "        1880.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
John Campbell.....	1 resident.....	Ironton, Ohio.....	\$300
C. C. Clarke.....	Secretary.....	".....	2,000
T. W. Means.....	Treasurer.....	Hanging Rock, O.....	
Jas. R. Martin.....	Superintendent.....	Ironton, Ohio.....	1,800
C. C. Clarke.....	{ General Passenger Ag't General Freight Agent General Ticket Agent.. }	".....	
Total salaries.....			\$4,100

## DIRECTORS.

Name.	Residence.	Name.	Residence.
John Campbell.....	Ironton, O..	T. W. Means .....	H'nging Rock, O.
John C. Clarke.....	Toledo, O..	E. B. Willard .....	" "
C. C. Clarke.....	Ironton, O..	Chas. Campbell.....	Ironton, Ohio.
Oscar Richey.....	" "		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$500,000 00
Number of shares—common.....	10,000
Par value of each—common.....	\$50 00
Capital stock authorized by vote of company—common .....	399,700 00
Amount subscribed—common.....	399,700 00
Total paid in capital stock—common.....	399,700 00
Increase since June 30, 1880—common.....	1,000 00
Average amount paid in per mile of single main track (18 miles).....	22,205 55
Proportion of same for Ohio (18 miles) .....	All.

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.
For subscriptions paid in cash .....	2,391	\$119,550
In payment of dividends.....	5,603	280,150
Total.....	7,994	\$399,700

Stockholders, residents of Ohio, 26.

Amount of stock held by them June 30, 1881, \$375,900.

Agents authorized to transfer stock: C. C. Clarke, Ironton, Ohio.

Number of shares transferred within the year at such agencies, 872.

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$9,042 92	
Total unfunded debt .....	9,042 92	
Cash securities, debit balances, etc., available to payment.....	10,144 62	
Total of paid in stock and debt.....		399,700
Total average amount per mile.. .....	\$22,205 55	
Proportion of same for Ohio.....	399,700 00	

## COST OF ROAD EQUIPMENT, Etc.

## TOTAL EXPENDITURES FOR CONSTRUCTION.

Expenditures prior to July 1st, 1880.....	\$349,245 48
“ for the year ending June 30th, 1881.....	8,074 65
Total expenditures to July 1st, 1881 .....	337,320 13

## COST OF ROAD AND EQUIPMENT OWNED BY COMPANY.

Five locomotives .....	\$40,400 00
One first-class passenger car, 1 second-class passenger car, box freight cars, 114 platform cars, 96 coal cars, mail and express cars, sleeping cars, section cars, hand cars, snow plows, caboose cars, director's and superintendent's cars, pay-cars, dump cars, track-laying cars and wrecking cars.....	54,210 00
Total cost of railroad equipment owned by company.....	\$94,610 00
Average amount per mile of single main track (18 miles).....	5,256 11
Proportion of same for Ohio. All.	
Total for road and equipment .....	431,930 13
Total average amount per mile (of single main track, 18 miles).....	23,996 12
Proportion of same for Ohio.....	431,930 13

## COST OF PROPERTY PURCHASED BY COMPANY NOT INCLUDED IN THE FOREGOING ACCOUNTS.

Real estate not included in the foregoing accounts.....	\$18,830 25
Other property not included in the foregoing accounts, and not including supplies and materials on hand.....	25,649 11

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Ironton to Center .....	12.75	12.75
Ironton to Whiteville .....	2.00	2 00
Etna Station to Ellisonville.....	2.00	2.00
Bartle's to Dean Station .....	1.25	1.25
Total single main track.....	18.	18.
Aggregate of sidings and other tracks.....	3	3
Total length laid with rail computed as single track.....	21	21
Laid with steel rail .....	2.5	2.5
Length in Ohio, distributed as follows :		

Lawrence county—main track, 12.75; branches, 5.25; sidings, etc., 3; total, 21.  
Steel rail, main track, 2.50.

## GAUGE, RAILS, ETC.

Gauge .....	4 $\frac{1}{8}$ feet.
Rail—Iron—On road .....	18 $\frac{1}{2}$ miles.
Average weight per yard .....	60 lbs.
Steel—On road.....	2 $\frac{1}{2}$ miles.
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	2,200
Number laid during the year .....	10,000
Ballasted—In Ohio—We are constantly ballasting with mill ashes and cinders.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—25; greatest age, 11 years; aggregate length, 722 feet.	
Iron—1;                      "                      20                      "                      "                      "                      94 feet.	
Total.....	816 "
Greatest space between cross ties upon bridges and trestles, 24 inches;	
length of ties, 8 feet.	
Number of track stringers, 2.	
Are all bridges and trestles provided with guard rails? No.	
Do all bridges and trestles receive stated examinations? Have no stated	
time.	
How often? About once a month.	
Are the examinations analytical, and are they made by a competent person? They	
are made by superintendent.	
Tunnels—Stone, solid rock roof, 1; length, 1,020 feet.	
Fencing—Length of road unfenced, and the reason therefor: The road runs through	
large tracts of rough mineral lands, owned by furnace companies, and	
fencing has not been thought necessary.	

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality? None	
on main line. The Scioto Valley Railway crosses four of our switches, or turn-	
outs, in Ironton.	
Number of crossings of highways at grade in this State without protection, 10.	
Number at which there are gates or flagmen, 1.	

## STATIONS.

Passenger and freight, in Ohio, 16.

## ROLLING STOCK.

Locomotives .....	5; Average weight.....	52,592 lbs.
Passenger cars .....	2;                      " .....	22,500 "
Freight cars.....	210;                      " .....	11,500 "
Other cars .....	1	

Number of locomotives equipped with train brakes: None. "

Kind of brake: Ratchet hand brake on tender.

Number of cars equipped with train brakes: None.

Kind: Hand brakes on every car.

Number of passenger cars with "Miller Platform": None.

Method of bridging between passenger cars, when two or more are run in trains: We ordinarily run but one car, attached to a freight train.

State methods of heating cars used for the transportation of passengers: In the car ordinarily used we have a Beeman patent railroad stove; an apparatus claimed to be so constructed that the fire will be extinguished as soon as the car is overturned.

Means of lighting same: Candles.

#### SPEED OF TRAINS.

Freight and express passenger, average rate, including stops. .... 15 miles per hour.  
Coal trains ..... 12 "

#### EMPLOYES.

Superintendents .....	1
Engineers .....	3
Flagmen, switch-tenders and watchmen .....	3
Clerks.....	2
Firemen .....	3
Wipers.....	3
Mechanics .....	8
Conductors .....	1
Brakemen .....	9
Station agents .....	2
Section men .....	29
Other employes.....	8

Total number employed by Company in operating line..... 72

Proportion for Ohio ..... 72

#### AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives	{ Passenger .....	10	Rails—Iron .....		10
	{ Freight .....	10	Joint fastenings.....		10
Cars.....	{ Passenger .....	10	Frogs .....		10
	{ Coal .....	10	Ties—Oak .....		6
	{ Flat.....	10	Bridges—Wooden .....		10

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile :

	Highest.	Lowest.	Average.
For distances less than 8 miles.....	5 Cts.	3½ Cts.	4 Cts.
For distances over 8 miles—1st class.....	3	3	3

## FREIGHT.

	Highest.	Lowest.	Average.
Rate per 100 lbs. per mile, when freight weighs less than a ton.....	3	1	2
Rate per ton per mile on freight carried less than 30 miles .....	33	3	5
Rate per ton per mile for—			
Coal—Carried 10 miles or more.....	...	...	...
Carried less than 10 miles .....	4	4	4
Pig iron—Carried 10 miles or more .....	5	4	4½
Carried less than 10 miles.....	5	5	5
Limestone—Carried ten miles or more .....	3	5	4
Carried less than ten miles .....	...	...	...
Iron Ore—Carried ten miles or more .....	5	4	4½
Carried less than ten miles.....	7	5	5½
Undressed stone or lumber—Carried 10 miles or more..	5	5	5
Carried less than 10 miles .....	8	6	7

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length.
No. 1, Texas Branch .....	V .....	Wood .....	30 feet.
No. 2, Texas Branch .....	V .....	" .....	30 "

Rail laid—Steel, 60 lbs. per yard—miles of track .....	2½
Train mileage—Passenger .....	132
Freight .....	25,201
Mixed .....	21,308
Construction .....	946
Other trains.. .....	54
Total .....	47,641
Car mileage—Passenger.....	18,229
Freight—loaded .....	176,272
Freight—empty .....	120,282
Total.....	314,783





## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30TH.

## EARNINGS.

Passenger transportation .....	\$11,538 05
Freight transportation .....	80,818 23
Other sources.....	3,122 72

Total earnings of line operated included in this report..... \$95,479 00

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$24,690 44
Maintenance of cars .....	9,652 14
Motive power .....	5,665 58
Conducting transportation .....	8,802 50
General expenses, as follows :	
Taxes in Ohio .....	2,921 47
Salaries .....	4,963 64
Other general expenses of operating .....	5,241 17

Total operating expenses, being 65 per cent. of earnings..... \$61,936 94

Net earnings of 18 miles operated..... 33,542 06

Percentage of same to capital stock and debt .....	8.39
Percentage of to total means applied to construction, etc.....	7.04
Per mile of earnings..... \$5,304 38; Proportion for Ohio.....	All.
operating expenses..... 3,440 93;                   " .....	All.
net earnings ..... 1,863 45;                   " .....	All.

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock..... \$222 00

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Dividends, rate 3 per cent on general stock.....	\$11,989 50
Last dividend declared on general stock, December 10, 1880.	
Floating debt liquidated .....	8,679 44
Construction of new work.....	8,074 65

Total..... \$28,743 59

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$399,700 00
Dividend No. 1.....	1 40
Pay-roll.....	2,580 10

Bills payable.....	400 00	
Profit and loss.....	124,252 85	
Due Treasurer.....	219 41	
Stock account.....	54 00	
Current income.....	48,974 70	
Book accounts.....	5,788 01	
		<hr/> \$581,970 47

## ASSETS.

Construction—Main Line.....	\$277,444 33	
“    Hecla Branch.....	17,777 46	
“    Etna Branch.....	30,151 08	
“    Texas Branch.....	11,947 26	
Rolling stock.....	94,610 00	
Real estate and round house. ....	44,479 36	
Cash with ticket agents.....	1,024 46	
Bills receivable.....	622 68	
Book accounts.....	37,518 63	
Judgments.....	1,687 08	
Suspended accounts.....	22,476 26	
Current expense account.....	42,231 87	
		<hr/> \$581,970 47

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880 Oct. 27	Nancy Fil- linger.....	None.....	Lying on track intoxicated.....	Killed.
2	1881 Mch. 18	P. McCann..	Brakeman ..	Want of caution.....	Hurt about hips.
3	June 24	S.B. Richards	Engineer.....	Engine thrown from track by a cow....	Leg slightly burned and bruised.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Others—Lying, walking, falling, or being on track ..... 1

## PERSONS INJURED—CAUSES.

Employes—Lying, walking, falling, or being on track..... 1  
 Engine or train leaving or thrown from track..... 1

Total..... 2

## RECAPITULATION.

Killed—Others—trespassing on track, etc.....	1
Total killed.....	1
Injured—Employees—from causes beyond their control.....	1
misconduct or want of caution.....	1
Total injured.....	2

## TRAIN ACCIDENTS—ENTIRE LINE.

Number.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880. June 17	Near Lawrence ....	Mixed .....	Derailment.....	About \$1,000.
2	1881. June 24	" Centre.....	Mixed .....	Cow on track.....	About \$500.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	1
Accidents not resulting in derailment of train.....	1
Total accidents.....	2

## Causes of accidents effecting derailment of trains:

Cattle on track.....	1
Unexplained .....	1
Total.....	2

*State of Ohio, County of Lawrence, ss.:*

C. C. Clarke, Manager of the Iron Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

C. C. CLARKE,

Manager Iron R. R. Co.

Subscribed and sworn to before me, this 29th day of August, A. D. 1881.

[SEAL.]

D. W. VOGLESONG,

Notary Public Lawrence County, O.

## LAKE ERIE AND WESTERN RAILWAY COMPANY.

Name of road : Lake Erie & Western Railway.

By whom owned : Lake Erie & Western Railway Company.

By whom operated : Lake Erie & Western Railway Company.

Name of Company making this report : Lake Erie & Western Railway Company.

General office at La Fayette, Indiana.

Principal office in Ohio at Sandusky.

Address correspondence relating to this report to A. J. Castator, Auditor, at La Fayette, Indiana.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Road extended since last report from Fremont to Sandusky, Ohio, a distance of twenty-two and ninety-seven hundredths (22.97) miles.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
C. R. Cummings.....	President.....	Chicago, Ill.....	\$2,500
Daniel P. Eells.....	1st Vice President .....	Cleveland, O .....	1,200
J. H. Cheney.....	3rd " .....	Bloomington, Ill .....	1,800
B. G. Mitchell.....	Secretary and Treasurer...	New York City .....	1,500
A. J. Castator.....	Auditor.....	La Fayette, Ind.....	2,400
E. H. Waldron.....	General Manager.....	" .....	5,000
D. S. Hill.....	Division Superintendent...	Sandusky, O.....	2,500
J. B. Clark .....	" .....	La Fayette, Ind.....	2,500
T. H. Perry.....	Chief Engineer.....	" .....	1,500
G. W. Smith .....	General Passenger Agent..	.....	2,400
W. S. Weed.....	General Freight Agent....	.....	3,000
C. R. Cummings.....	} Executive Committee.. {	Chicago, Ill.....	.....
Daniel P. Eells.....		Cleveland, O .....	.....
C. S. Brice.....		Lima, O .....	.....
Geo. I. Seney.....		New York City.....	.....
W. H. Brown .....		" .....	.....
Total salaries.....	.....	.....	\$26,300

### DIRECTORS.

Name.	Residence.	Name.	Residence.
C. R. Cummings.....	Chicago, Ill.....	John T. Martin.....	New York City.
Daniel P. Eells.....	Cleveland, O.....	E. H. R. Lyman.....	"
J. H. Cheney.....	Bloomington, Ill	A. M. White.....	"
C. S. Brice.....	Lima, O.....	Chas. Foster .....	Fostoria, O.
Geo. I. Seney .....	New York City..	John S. Newberry.....	Detroit, Mich.
W. H. Brown .....	" .....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$700,000 00
Number of shares—common.....	70,000
Par value of each—common.....	\$100 00
Capital stock authorized by vote of company—common .....	700,000 00
Increase since June 30, 1880—common.....	700,000 00

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

On what account.	No. shares.	Amount of common.
For construction on extension of line or branches.....	7,000	\$700,000
Organization of company.....	70,000	7,700,000
Total.....	77,000	\$7,700,000

Stockholders, residents of Ohio, 4.

Amount of stock held by them June 30, 1881, \$1,300.

Agents authorized to transfer stock: Metropolitan National Bank, of New York City.

Number of shares transferred within the year at such agencies, 201,134.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....		May 1, 1879...	1919			\$2,500,000
" .....		Aug. 1, 1879...	1919			1,815,000
" .....		1, 1880...	1920			327,000
Income bonds.....		May 1, 1879...	1899			1,000,000
" .....		Aug. 1, 1879...	1899			1,485,000
" .....		1, 1880...	1920			600,000
Total.....						\$7,727,000

Average amount per mile of single main track (386.43 miles) ..... \$19,996 00

Proportion of same for Ohio (145.70.....) ..... 2,913,417 20

Increase since June 30, 1880..... 927,000 00

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$349,862 61
Total unfunded debt.....	349,862 61
Cash securities, debit balances, etc., available to payment...	85,098 29
Net unfunded debt .....	\$264,764 32
Average amount per mile of single main track.....	\$685 15
Proportion of same for Ohio.....	99,826 36

\* Interest at such rate as the net earnings will pay in any particular year, not exceeding seven per cent., and to be non-cumulative.

Increase since June 30, 1880.....	264,764 32
Total net debt liabilities .....	7,991,764 32
Average amount per mile of single main track.....	\$20,681 01
Proportion of same for Ohio.....	3,013,223 15
Total of paid in stock and debt.....	15,691,764 32
Total average amount per mile.....	\$40,607 00
Proportion of same for Ohio.....	5,916,439 90

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

Total expenditures for construction: Prior to July 1, 1880, \$13,414,271.32; for the year ending June 30, 1881, \$1,216,972.73; Total expenditures to July 1, 1881, \$14,631,244.05.

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 43.....	\$258,073 00
First and second-class passenger cars, 20.....	56,700 00
Box freight cars, 1,124.....	447,428 17
Platform cars, 205.....	58,929 00
Baggage, mail and express cars, 14.....	28,000 00
Stock cars, 140.....	56,000 00
Hand cars, 115.....	4,600 00
Caboose cars, 18.....	10,800 00
Directors' and Superintendents' cars, 1.....	7 600 00
Dump, pile-driving car, 1.....	2,500 00
Wrecking cars, 1.....	500 00
Total cost of railroad equipment owned by company.....	931,130 17
Additions within the year ending June 30, 1881.....	96,223 69
Average amount per mile (of single main track, 386.43 miles).....	2,409 57
Proportion for Ohio (145.7 miles).....	351,074 35
Total for road and equipment .....	15,562,374 22
Total average amount per mile (of single main track, 386.43 miles).....	40,272 17
Proportion of same for Ohio (145.7 miles).....	5,867,655 17

## COST OF PROPERTY PURCHASED BY COMPANY NOT INCLUDED IN THE FOREGOING ACCOUNTS.

Other property not included in the foregoing accounts, and not including supplies and materials on hand.....	\$20,919 79
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## OTHER ITEMS CHARGED TO PERMANENT INVESTMENT.

Total permanent investment.....	\$15,583,294 01
Proportion for Ohio (145.7 miles).....	5,875,546 28
Average per mile (of single main track, 386.43 miles).....	40,326 33

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Sandusky, O., to Bloomington, Ills.....	377.23	136.50
Mt. Mary's, O., to Minster, O.....	9.20	9.20
Total single main track.....	386.43	145.70
Aggregate of sidings and other tracks.....	32.60	11.70
Total length laid with rail computed as single track.....	419.03	157.40

Length in Ohio, distributed as follows :

County.	Main track.	Branches.	Sidings, etc.	Total.
Erie.....	7.2		.3	7.5
Sandusky.....	27.2		2.2	29.4
Seneca.....	10.2		.7	10.9
Hancock.....	30.3		1.7	32.
Allen.....	23.3		2.7	26.
Auglaize.....	16.	9.20	2.3	27.5
Mercer.....	22.3		1.8	24.1
Totals.....	136.50	9.20	11.7	157.4

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4.71 feet.
Grade—Maximum, per mile.....	60 "
Longest maximum.....	5,000 "
Aggregate length of maximum.....	10,560 "
Curvature—Shortest radius.....	319 "
Aggregate length of shortest radius.....	175 "
Aggregate length of all radii.....	117,380 "
Aggregate length of tangent.....	350.97 miles.
Rail—Iron—Average weight per yard.....	56 lbs.
Steel—Average weight per yard.....	52 "
Ties—Average number per mile.....	2,640
Ballasted—On whole line.....	386.43 miles.
In Ohio.....	145.70 "
With earth, gravel, rock and cinders.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 8; greatest age, 15 years; aggregate length, 1,976 feet.
Trestles—139; greatest age, 10 years; greatest height, 25 feet; greatest length, 2,600 feet; aggregate length, 10,929 feet.
Length of shortest span of truss, 50 feet; of longest, 150 feet; greatest length of beams between points of support, if not trussed, 16 feet.



Greatest space between cross ties upon bridges and trestles, 6 inches;  
length of ties, 10 feet.

Number of track-stringers, 4. Packed in pairs.

Are all bridges and trestles provided with guard rails? No.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent person? Yes.

#### FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	481	191
Average cost of same per rod, \$1.00.		
Length of road unfenced, and the reason therefor: No immediate demand for it.....	146	52½

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Cincinnati, Sandusky and Cleveland Railroad, at Sandusky, Ohio.

Lake Shore and Michigan Southern Railway, at Fremont, Ohio.

North Western Ohio Railway, at Burgoon, Ohio.

B. & O. and Ohio Central Railway, at Fostoria, Ohio.

Columbus and Toledo Railroad, at Fostoria, Ohio.

C., H. & D. and P., Ft. W. & C. Railroads, at Lima, Ohio.

Toledo, Delphos and Burlington Railroad, at Celina, Ohio.

Number of crossings of highways at grade in this State without protection, 137.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 2.

Number of crossings of highways under railroad, 4.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated.....	386.43; in Ohio, 145.70
Miles of same owned by railroad company.....	386.43; " 145.70

##### STATIONS.

Passenger and freight..... 95; in Ohio, 34

Number with telegraph communication..... 64; " 20

Number of same operated by railroad company..... 64; " 20

Is pay received for messages sent over line owned by railroad company? Yes, by  
W. U. Telegraph Company.

## ROLLING STOCK.

Locomotives .....	43; average weight, lbs.....	100,000
Express and baggage cars .....	14; " " .....	40,000
Passenger cars .....	18; " " .....	50,000
Parlor and sleeping cars (chair).....	2; " " .....	50,000
Freight cars .....	1,472; " " .....	19,000
Other cars .....	3;	

Number of locomotives equipped with train brakes, 12.

Kind of brake: Westinghouse automatic attachment.

Number of cars equipped with train brakes, 28.

Kind: Automatic.

Number of passenger cars with Miller Platform, 19.

Method of bridging between passenger cars, when two or more are run in trains:

None; unnecessary with Miller Platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Spear stoves; hard coal.

Means of lighting same: Lamps; mineral sperm oil.

## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	25 miles per hour.
Mail and accommodation, " .....	24 "
Freight trains, " .....	10 "

## EMPLOYES.

Superintendents .....	2
Telegraph operators .....	27
Engineers .....	42
Baggagemen .....	14
Flagmen, switch-tenders and watchmen .....	19
Laborers .....	18
Clerks .....	52
Train dispatchers .....	7
Firemen .....	41
Wipers .....	22
Mechanics .....	15
Conductors .....	33
Brakemen .....	65
Station agents .....	58
Section men .....	591
Other employees .....	158

Total number employed by Company in operating line.....	1,164
Proportion for Ohio.....	438.9

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road:

United States Express Co.

Terms: \$1,652.50 per month for freight carried.

Special freight and transportation lines: No contracts, except for usual interchange of business.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives .....	{ Passenger .....	20	Rails .....	{ Iron .....	8
	{ Freight .....	20		{ Steel—Not known .....	.....
Cars .....	{ Passenger .....	10	Joint fastenings .....		8
	{ Baggage .....	10	Frogs .....		8
	{ Box .....	10	Ties—Oak .....		9
	{ Stock .....	10	Bridges .....	{ Wooden .....	12
	{ Coal .....	10		{ Trestles .....	12
	{ Flat .....	10		{ Piling .....	12
			Fence posts .....		6

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles.....	4 Cts.	2½ Cts.	3 Cts.
For distances over 8 miles—First class.....	4	2	3
Second class .....	2	1	2
Emigrant .....	2	1	1½
Excursion .....	2	1	1½

Amount charged, in addition to regular fares, in sleeping or other cars run on your road: Chair cars, 100 miles or less, 25c.; between 100 miles and 200 miles, 35c.; between 200 and 300 miles, 50c.; over 300 miles, 60c.

## FREIGHT.

	Highest.	Lowest.	Average.
Rate per 100 lbs per mile when freight weighs less than a ton:			
First class.....	2.8 Cts.	.19 Cts.	3. Cts.
Second class.....	2.6	.16	1.38
Third class.....	2.1	.13	1.12
Fourth class.....	1.6	.11	.85
Fifth class .....	1.2	.08	.64
Special class .....	.5	.05	.50

## Rate per ton per mile on freight carried less than 30 miles:

First class.....	56	15.2	35.6
Second class.....	52	13.6	32.8
Third class.....	44	12	28
Fourth class.....	32	8.8	20.4
Fifth class.....	28	5.6	16.8
Special class.....	10	4	7

## Rate per ton per mile on freight carried more than 30 miles:

First class.....	12.6	3.9	8.25
Second class.....	10.8	3.3	7.5
Third class.....	9	2.7	5.85
Fourth class.....	7	2.1	4.55
Fifth class.....	4.4	1.5	2.95
Special class.....	3.4	1.1	2.25

## •Rate per ton per mile for—

Coal—Carried ten miles or more.....	5	.70	2.85
carried less than ten miles.....	10	5	7.50
Pig iron—Carried ten miles or more.....	3.2	1.2	2.2
carried less than ten miles.....	3.2	3.2	3.2
Limestone—Carried ten miles or more.....	5	1	3
carried less than ten miles.....	10	5	7.50
Undressed stone or lumber—Carried ten miles or more.....	5	1.1	3.05
Undressed stone or lumber—Carried less than ten miles.....	10	5	7.50

## DOINGS OF THE YEAR ENDING JUNE 30TH.

## Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length—feet.
Sandusky River.....	Howe truss.....	Wood.....	1,200
Green River.....	“.....	“.....	50

Trestles built in Ohio, 18; aggregate length, 5,140 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, 90 cts.), 15.

Grading—Miles of main track graded, in Ohio, 22.

Ballasting—Miles of main track ballasted with rock and gravel, 22.

Rail laid—Steel, 52 lbs. per yard—miles of track, 30.

Train mileage—Passenger.....	503,318
Freight.....	655,792
Construction.....	54,454

Total.....	1,213,564
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Car mileage—Passenger.....	1,083,063	
Express and baggage .....	536,532	
Freight—loaded.....	6,547,063	
empty.....	1,877,402	
Caboose .....	485,430	
Construction and other .....	435,632	
		<hr/>
Total.....		10,965,122
Fuel consumed—Wood, 1,141 cords; coal, 51,713 tons; total cost.....		\$116,101 92
Losses, etc., paid—On goods and baggage.....		3,136 19
For injuries in Ohio, fatal and non-fatal:		
To employes .....		956 87
For animals killed and injured in Ohio:		
Horses, 20.....	\$1,035 83	
Mule, 1.....	30 00	
Cattle, 54.....	750 55	
Sheep, 8.....	15 50	
Hogs, 9.....	46 85	
		<hr/>
Total.....		1,878 73

## TRANSPORTATION.

Passengers—Number carried, local.....	318,146	
through .....	25,355	
		<hr/>
Total.....		343,501
Average number carried in each car per trip.....		91
Average number of miles traveled by each.....		31.53
Total mileage, or number carried one mile.....		10,832,564
Average amount received for each .....		94.17 cents.
Average amount per mile received for each .....		2.98 “
Freight—Tons carried, local.....	535,694	
through.....	139,898	
		<hr/>
Total .....		675,592
Total movement, or tons carried one mile.....		92,168,262
Average amount received for each ton .....		136 cents.
Average amount per mile received for each ton.....		.995 “
Articles transported:		
	Tons.	Per cent.
Coal .....	41,244	6.10
Stone, lime, sand, etc .....	12,034	1.79
Pig and bloom iron } .....	4,207	.62
Manufactured iron }		
Lumber and other forest products.....	105,660	15.64
Grain, flour, and other agricultural products .....	360,140	53.31

Live stock.....	28,287	4.19
Merchandise } .....	124,020	18.35
Miscellaneous } .....		
Total tonnage yielding revenue.....		100
	675,592	

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local .....	\$209,995 40	
through .....	113,478 81	
Total .....		\$323,474 21
Freight transportation—local .....	\$727,880 23	
through .....	189,089 12	
Total .....		916,969 35
Mail service.....	22,710 30	
Express service.....	15,757 50	
Other sources .....	132,865 54	
Total earnings of line operated included in this report.....		\$1,411,776 90

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$361,292 14	
Maintenance of cars—locomotives.....	107,098 73	
Motive power } .....	509,761 63	
Conducting transportation } .....		
General expenses:		
Taxes .....	36,934 26	
Salaries and office supplies .....	42,551 63	
Other general expenses of operating.....	24,983 41	
Total operating expenses, being 76.68 <sup>2</sup> per cent. of earnings.....		\$1,082,621 80
Net earnings of 386.43 miles operated.....		329,155 10
Rentals paid (for use of road, track, depots, equipment), etc.....		11,580 90
Net income over operating expenses and rents paid .....		317,574 20
Percentage of same to capital stock and debt, 2.06.		
Percentage of to total means applied to construction, etc., 2.04.		
Per mile of earnings.....	\$3,653 38; Proport'n for O. (145.7 miles)	532,297 47
operating expenses	2,801 60; " " "	408,193 12
net earnings .....	851 78; " " "	124,104 35

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Sale of bonds of company .....	\$677,790 18
Sale of stock.....	209,800 00
City of Sandusky, O .....	60,000 00
	<hr/> \$947,590 18

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Applied to sinking fund—stock and bonds issued.....	\$1,627,000 00
Construction of new work.....	689,016 05
Additional equipment .....	96,223 69
	<hr/> \$2,412,239 74

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Capital stock .....	\$7,700,000 00
Funded debt.....	7,907,000 00
Interest unpaid, not due .....	84,550 00
Vouchers and accounts .....	225,023 56
Other liabilities.....	40,289 05
	<hr/> \$15,956,862 61

## ASSETS.

Construction .....	\$14,631,244 05
Equipment account.....	931,130 17
First National Bank, Sandusky, O.....	25,000 00
Metropolitan National Bank, N. Y.....	174,439 15
U. S. Government P. O. Dep't .....	5,588 51
U. S. Express Co .....	1,652 50
Accounts receivable .....	1,401 62
Due from agents and companies.....	22,059 86
Material and supplies.....	95,796 99
Cash on hand .....	61,636 81
Debit balance.....	6,912 95
	<hr/> \$15,956,862 61



# ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880.				
1	Aug. 12	J. W. Comrie.....	Brakeman.....	Coupling.....	Leg run over.
2	27	Milton Bowlus.....	".....	Fell from car.....	Bruised slightly.
3	30	Chas. Dragoo.....	".....	Run over.....	Leg cut off.
4	Sept. 3	Dan. Flannery.....	".....	Coupling.....	Hand mashed.
5	5	Thos. Gallagher.....	Section foreman..	Spike flew and struck him.....	Shin injured.
6	Oct. 7	Geo. Schutze.....	Yardmaster.....	Coupling.....	Hand mashed.
7	24	Colgan—child.....	".....	Pulled from hand car by mother..	Run over by hand car.
8	30	Mich. Ellicott.....	Unknown.....	Run over in yards.....	Killed.
9	Nov. 6	M. Connella.....	Brakeman.....	Fell from car, switching.....	Bruised.
10	.....	Mich. Meerhan.....	".....	Coupling.....	Fingers mashed.
11	Dec. 9	Wm. Richey.....	".....	Fell from car.....	Bruised.
	1881.				
12	Jan'y 20	M. Flannagan.....	Laborer.....	Changing rail—no flag out.....	Killed.
13	20	Frank Loomis.....	".....	".....	Crippled.
14	Feb'y 20	S. H. Hill.....	Brakeman.....	Fell from train.....	Killed.
15	April 12	J. D. McKerren.....	Shopman.....	Chip from wheel hit him.....	Face bruised and cut.
16	15	M. Bowles.....	Brakeman.....	Coupling.....	Hand injured.
17	15	Wm. Sheelin.....	Laborer.....	Loading axles and block broke.....	Foot badly cut.
18	May 8	Jno. Cramer.....	Brakeman.....	Coupling.....	Finger mashed.
19	21	G. H. White.....	".....	".....	Hand mashed.
20	26	R. A. Thayer.....	".....	".....	"
21	June 13	Jerry Delau.....	Employee L. S. & M. S. R'y.....	Run over in yard; did not heed timely warning.....	Killed.

## SUMMARY OF ACCIDENTS.

Persons killed—Causes.	Passengers.	Employees.	Others.	Totals.
Run over in yards, on sidings, or in switching .....			1	1
Falling or thrown from engine or train.....		1		1
Engine or train leaving or thrown from track .....		1		1
Lying, walking, falling, or being on track.....			1	1
Totals .....		2	2	4

Persons injured—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....			1	1
Coupling, or caught between cars and engine.....		8		8
Falling or thrown from engine or train .....		3		3
Lying, walking, falling, or being on track.....			1	1
Miscellaneous .....		4		4
Totals .....		15	2	17

## RECAPITULATION.

Killed—Employees—from misconduct or want of caution.....	2
Others—at stations and highway crossings .....	1
trespassing, on track, etc .....	1
Total killed .....	4
Injured—Employees—from causes beyond their control .....	2
misconduct or want of caution.....	13
Others—stealing rides.....	1
trespassing on track, etc.....	1
Total injured.....	17

## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880. Aug. 19	Buckland, O.....	Passenger.....	Collided with freight.....	Engine and caboose mashed.
2	Nov. 29	Fostoria, O.....	Special.....	".....	".....
3	30	".....	Work.....	Ran off switch and through a bridge.....	Engine and two cars ditched. Staved end of tank in.
4	Dec. 10	Ambia, Ind.....	Freight.....	Train broke in two.....	
5	1881. Jan. 14	Lima, O.....	".....	Broken rail.....	Off track.
6	20	Bluffton, O.....	".....	Changing rail.....	Three cars off track; killed a section man, hurt another.
7	24	Lima, O.....	".....	Brake dropped down.....	Off track.
8	27	".....	Passenger.....	Journal broken.....	".....
9	Feb. 1	Boyleston, Ind.....	Freight.....	Broken rail.....	".....
10	7	Frankfort, Ind.....	".....	Caboose jumped track.....	".....
11	11	Mt. Morency, Ind.....	Passenger.....	Collided with pay-car C. L. & C. R'y.....	Engine mashed.
12	8	Beaver Dam, O.....	Freight.....	Misplaced switch.....	Engine off switch.
13	27	Frankfort, Ind.....	".....	Car-trucks broke down.	Six cars off track.
14	4	Gibson, Ills.....	Passenger.....	Broken rail.....	Off track.
15	Mar. 1	Boyleston, Ind.....	Freight.....	".....	".....
16	1	".....	".....	".....	Five cars off track.
17	2	Frankfort, Ind.....	".....	".....	Eight cars off track.
18	7	Beaver Dam, O.....	".....	Jumped track.....	Five cars ditched.
19	9	Gilman, Ind.....	Passenger.....	Struck cow.....	Train off track.
20	16	Lima, O.....	Freight.....	Track spread.....	Two cars off track.
21	24	Witmores, O.....	".....	Ran off switch.....	Engine off track.
22	28	Dayton, Ind.....	".....	Ties fell off flat car and threw trucks off.....	Knocked bridge down.
23	April 19	Castalia, O.....	".....	Broken switch.....	Seven cars off track.
24	27	".....	".....	Jumped track.....	Five cars wrecked.
25	May 4	".....	".....	".....	Twelve cars ditched.
26	21	LaFayette, Ind.....	Switch eng'e.....	Collided with engine C. L. & C. R'y.....	Engine damaged.
27	26	Dayton, Ind.....	Freight.....	Struck stock.....	Fireman killed; engine and seven cars ditched.
28	June 6	Bluffton, O.....	".....	Brakeman failed to set brakes.....	Ran off switch.
29	7	Lima, O.....	Engine.....	Ran off siding.....	Tipped over.
30	8	Kempton, Ind.....	Passenger.....	Struck cow.....	Engine and baggage car off.
31	17	Albany, Ind.....	Pay-car.....	Collided with freight.....	Six cars ditched.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	25
Accidents not resulting in derailment of train .....	1
Collisions—butting.....	1
crossing.....	1
rear .....	3

Total accidents ..... 31

## Causes of accidents effecting derailment of trains:

Accidental obstruction.....	1
Broken axle .....	1
Broken rail .....	6
Broken switch-rod.....	1
Broken truck and brake beam.....	2
Cattle on track.....	3
Misplaced switch (purposely).....	1
Rail removed for repairs.....	1
Running off end of sidings.....	3
Spreading of rails.....	1
Other causes .....	5

Total..... 25

## Causes of collisions :

Blinded by storm .....	1
Misplaced switch.....	1
Orders—absence of, mistake in, neglect or disobedience to .....	1
Running carelessly .....	1
Unexplained .....	1
Total.....	5

## Causes of accidents not resulting in derailment of trains:

Broken connecting rod.....	1
Total .....	1
Total derailment.....	25
Total collisions.....	5
Total accidents .....	31

*State of Indiana, County of Tippecanoe, ss.:*

Edward H. Waldron, General Manager in charge of the Lake Erie and Western Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

E. H. WALDRON,

*Gen'l Manager.*

Subscribed and sworn to before me, this 9th day of September, A.D. 1881.

WM. W. WENTZ, JR.,

[SEAL]

*Notary Public.*

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY COMPANY.

Name of road : Lake Shore & Michigan Southern Railway.  
By whom owned : Lake Shore & Michigan Southern Railway Company.  
By whom operated : Lake Shore & Michigan Southern Railway Company.  
Name of person making this report : C. P. Leland, Auditor L. S. & M. S. R'y Co.  
General office at Cleveland, O.  
Principal office in Ohio at Cleveland.  
Address correspondence relating to this report to C. P. Leland, Auditor, at Cleveland.

HISTORY OF ORGANIZATION AND CONSTRUCTION.

Given before—no change.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. H. Vanderbilt.....	President.....	New York .....	.....
Augustus Schell.....	Vice President.....	“ .....	.....
E. D. Worcester .....	Secretary and Treasurer..	“ .....	.....
C. P. Leland.....	Auditor .....	Cleveland .....	.....
John Newell.....	General Manager.....	“ .....	.....
Charles Paine .....	General Superintendent...	“ .....	.....
L. H. Clarke.....	Chief Engineer .....	“ .....	.....
W. P. Johnson.....	General Passenger Agent..	Chicago .....	.....
Addison Hills.....	General Freight Agent .....	Cleveland .....	.....
J. W. Cary .....	General Ticket Agent.....	“ .....	.....
W. H. Vanderbilt.....	Executive Committee. {	New York.....	.....
C. Vanderbilt.....			.....
W. K. Vanderbilt.....			.....
Augustus Schell.....			.....
Samuel F. Barger.....			.....
Total salaries of above officers.....			\$58,500

DIRECTORS.

Name.	Residence.	Name.	Residence.
Wm. H. Vanderbilt.....	New York.....	Amasa Stone .....	Cleveland
Cornelius Vanderbilt...	“ .....	Henry B Payne.....	“
Wm. K. Vanderbilt.....	“ .....	William L. Scott.....	Erie, Pa.
Augustus Schell .....	“ .....	Charles M. Reed.....	“
Samuel Barger.....	“ .....	Rasselas Brown.....	Warren, Pa.
John E. Burrill.....	“ .....	Albert Keep.....	Chicago Ill.
Darius O. Mills.....	“ .....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$49,466,500 00
preferred.....	533,500 00
Number of shares—common.....	494,665
preferred .....	5,335
Par value of each—common.....	\$100 00
preferred .....	100 00
Capital stock authorized by vote of Company—common.....	50,000,000 00
preferred .....	
Amount subscribed—common.....	
preferred .....	
Total paid in capital stock—common.....	
preferred.....	
Average amount paid in per mile of single main track (1024.94 miles)	48,794 30
Proportion of same for Ohio (377.61 miles).....	18,425,703 57
Stockholders, residents of Ohio, 549.	
Amount of stock held by them June 30, 1881, \$3,561,500.00.	
Agents authorized to transfer stock: Stock transferred at our New York office	
Room 47, Grand Central Depot.	
Number of shares transferred within the year at such agencies: 779,720.	

## FUNDED DEBT.

1. Kind of bond or obligations.	2. Date of issue.	3. When due.	4. Rate of interest.	5. Amount actually issued.
L. S. & M. S. consolidated first mortgage sinking fund bonds.....	July 1, 1870	July 1, 1900	7 per cent.	\$9,206,000 00
L. S. & M. S. dividend bonds.....	April 1, 1889	April 1, 1899	7 "	1,356,000 00
Clev., Painesville & Ashtabula 3d mortgage.....	Oct. 1, 1867	Oct. 1, 1892	7 "	920,000 00
Mich. Southern & North. Indiana 1st mortgage .....	May 1, 1855	May 1, 1885	7 "	5,240,000 00
Cleveland & Toledo 1st mortgage.....	July 1, 1855	July 1, 1885	7 "	1,595,000 00
Cleveland & Toledo 2d mortgage.....	April 1, 1866	April 1, 1886	7 "	849,000 00
Buffalo & State Line — mortgage.....	July 1, 1862	July 1, 1882	7 "	200,000 00
Buffalo & State Line — mortgage.....	Sept. 1, 1866	Sept. 1, 1886	7 "	300,000 00
Buffalo & Erie — mortgage.....	April 1, 1868	April 1, 1898	7 "	2,834,000 00
Total amount outstanding of first general mortgage of \$25,000,000 .....				\$22,500,000 00
L. S. & M. S. consolidated 2d general mortgage.....	Dec. 1, 1873	Dec. 1, 1903	7 per cent.	10,628,000 00
L. S. & M. S. bonds of 1882 .....	Oct. 1, 1872	Oct. 1, 1882	7 "	2,537,000 00
Total amount outstanding of second general mortgage of \$25,000,000 .....				\$13,165,000 00
Total funded debt, L. S. & M. S. R'y Co., proper.....				36,665,000 00
Detroit, Monroe & Toledo R. R. ....			7 per cent.	924,000 00
Kalamazoo & White Pigeon R. R. ....			7 & 8 "	600,000 00
Total .....				\$37,189,000 00

Average amount per mile of single main track (1,024.94 miles).....	\$36,281 95
Proportion of same for Ohio (377.61 miles).....	13,700,427 51
Decrease since June 30, 1880 .....	250,000 00

## OTHER INDEBTEDNESS.

Net unfunded debt (quick assets exceed current liabilities).

Total of paid in stock and debt..... \$87,189,000 00

Total average amount per mile..... \$85,076 25

Proportion of same for Ohio..... 32,124,133 08

## COST OF ROAD EQUIPMENT, Etc.

Total expenditures for construction..... \$65,600,000 00

## ROAD ACQUIRED BY PURCHASE.

Detroit, Monroe & Toledo (original cost, \$1,295,600) built for..... \$1,295,600 00

Kalamazoo & White Pigeon, purchased for ..... 610,000 00

Northern Central Michigan (original cost, \$1,357,000) built for ..... 1,357,000 00

Total expended for construction and purchase ..... \$68,862,600 00

Average cost per mile of road constructed..... 67,183 02

Average cost per mile of road owned by company..... 67,183 02

Proportion of same for Ohio (377.61 miles)..... 25,368,980 18

## COST OF EQUIPMENT OWNED BY COMPANY.

Five hundred and two locomotives, 98 first-class passenger cars, 65 second-class passenger (44) and emigrant (21) cars, 8,181 box freight cars, 1,869 platform cars, 1,986 coal cars, 47 baggage cars, 33 mail and express cars, 1,648 stock cars, 257 caboose cars, 2 director's and superintendent's cars, 2 pay cars, 148 dump cars, 9 wrecking cars, all other rolling stock, tools, machinery, etc.—total cost of

railroad equipment owned by company ..... \$14,378,000 00

Average amount per mile (of single main track 1,177.67 miles)..... 12,208 85

Proportion for Ohio (420.81 miles)..... 5,137,606 17

Total for road and equipment ..... \$83,240,600 00

Total average amount per mile (of single main track, 1,024.94 miles)... 79,391 87

Proportion of same for Ohio (377.61 miles)..... 30,506,342 43

## COST OF PROPERTY PURCHASED BY COMPANY NOT INCLUDED IN THE FOREGOING ACCOUNTS.

Real estate not included in the foregoing accounts ..... \$223,595 97

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Buffalo to Chicago .....	540.49 mi.	195.01 mi.
Elyria Junction via Sandusky to Millbury Junction.....	72.95	72.95
Sandusky Junction Pier Branch to Old Depot.....	3.72	3.72



Air Line Junction to Elkhart.....	130.83	64.90
“ “ “ Detroit.....	62.56	7.70
Lenawee “ “ Jackson.....	41.98	
“ “ “ Monroe .....	29.37	
Palmyra “ Adrian .....	5.72	
White Pigeon “ Kalamazoo.....	36.57	
Kalamazoo “ Grand Rapids....	58.42	
Jonesville “ North Lansing...	61.14	
Ashtabula “ Ashtabula Harb'r	2.33	2.33
“ “ Jamestown.....	35.98	30.80
Jamestown “ Oil City.....	50.91	
Andover “ Youngstown.....	38.31	38.31
Tyrrell Hill “ Vienna .....	2.68	2.68
Vienna “ Holliday Bank....	1.42	1.42
Coalburg “ New York.....	0.99	0.99
Junction with D. A. V. and P. R. R., Dunkirk .....	1.50	
<hr/>		
Total single main track.....	1177.07 mi.	420.81 mi.
Double track, Buffalo to Cleveland.....	183.50	69.94
Between Cleveland and west end Maumee Bridge.....	46.07	46.07
Between west end Maumee Bridge and Chicago.....	18.94	3.69
Aggregate of sidings and other tracks.....	474.17	221.33
<hr/>		
Total length laid with rail computed as single track...	1900.35 mi.	761.84 mi.
Laid with steel rail.....	1150.16	506.83

Length in Ohio, distributed as follows :

County.	Main track.	Branches.	Double track.	Sidings, etc.	Total.
Ashtabula .....	27.78	40.98	27.78	19.27	115.81
Lake .....	28.50		28.56	8.83	65.83
Trumbull .....		32.65		3.85	36.50
Cuyahoga .....	31.32		32.13	47.66	111.18
Mahoning .....		2.90		3.03	5.93
Lorain .....	34.97		15.93	19.84	70.74
Erie .....	28.74	3.72	0.06	20.45	52.97
Huron .....	26.63			11.57	38.20
Sandusky .....	26.66			8.12	34.78
Ottawa .....	41.67		3.97	16.12	61.76
Wood .....	7.70		7.24	1.78	16.72
Lucas .....	13.99	23.81	4.09	50.86	92.75
Fulton .....		24.49		5.72	30.21
Williams .....		24.30		4.23	28.53
Totals.....	267.96	152.85	119.70	221.33	761.84

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
K. A. & G. Rapids R. R., Kalamazoo to Grand Rapids.....	58.42 miles,	
J. & F. R. R., Jamestown to Oil City.....	50.91	
Mahoning Coal R. R., Andover to Youngstown and Branch...	43.40	43.40
Total single track.....	152.73	43.40
Sidings and other tracks.....	37.33	8.52
Total.....	190.06	51.92

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4 feet 8½ in.
Grade—Maximum, per mile, in Ohio.....	71.02 feet.
Longest maximum       “.....	3300 “
Aggregate length of maximum, in Ohio.....	3300 “
Curvature—Shortest radius, in Ohio.....	1146 “
Aggregate length of shortest radius, in Ohio.....	680 miles.
Aggregate length of all radii, in Ohio.....	37.92 “
Aggregate length of tangent,       “.....	374.06 “
Rail—Iron—On road (includes sidings), total line.....	750.19 “
Weight per yard (includes sidings), total line.....	45, 50, 56 & 60 lbs.
Steel—On road       “       “       “.....	1150.16 miles.
Average weight per yard (includes sidings), total line..	60 & 65 lbs.
Ties—Average number per mile       “       “       “ ..	2,800
Number laid during the year       “       “       “ ..	533,470
Ballasted—On whole line, all ballasted.	
With gravel, stone and cinders.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood—22; greatest age, 13 years; aggregate length, 3,150 ft.	
Iron, 25;       “       12 years;       “	2,857
Stone arch, 11;       “	2,039
Total.....	8,046
Trestles—100; greatest age, 7 years; greatest height, 41 ft.; greatest length, 466 feet; aggregate length, 6,176 feet.	
Length of shortest span of truss, 48 feet; of longest, 165; greatest length of beams between points of support, if not trussed, 15 ft.	
Greatest space between cross ties upon bridges and trestles, standard, 5 inches; length of ties, 8 to 12 feet.	
Number of track stringers, 4.	
Are all bridges and trestles provided with guard rails?   Yes.	
Do all bridges and trestles receive stated examinations?   Yes.	
How often?   Monthly.	
Are the examinations analytical, and are they made by a competent person?   Yes.	

Tunnel—Stone, 1; length, 114 feet.

Fencing—Average and Aggregate Cost.	Whole Line.	In Ohio.
Number miles fencing computed as single line.....	2,217.75 miles.	777.65 miles.
Kind of fencing, as follows:		
Post and board (average cost per rod \$1.00).....	1,702.85	608.25
Rail (average cost per rod 65c).....	381.45	129.43
Wire (average cost per rod 80c).....	110.82	36.18
Picket (average cost per rod \$1.25).....		
Snow (average cost per rod \$2.95). ....	0.49	
Hedge.....	6.35	
Average cost of fencing, lumber at present \$10.50 per 1,000 feet.....	15.79	3.79
Average cost of same per rod, of all fence built, 93½c per rod.		
Length of road unfenced, and the reason therefor: At embankments, bridges, etc., and through cities, at stations and lake front, and where it belongs to property owners to fence.....	58.48	23.16

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

C., T., V. & W. Railroad at Elyria.

B. & O. Railroad at Monroeville and Sandusky.

L., B. & W. Railway at Clyde and Sandusky.

N. Y., I. a. & O. Railroad at Youngstown, Latimer and Doughton.

L. E. & W. Railway at Fremont.

North Western Ohio Railway at East Toledo.

C. H & D. Railroad at East Toledo.

W., St. L. & P. Railway at Toledo.

T. & A. A. Railroad at Alexis.

Pennsylvania Company Railroad at Cleveland and Ashtabula.

P. & Y. Railway at Painesville.

What railroads cross your road over your grade in this State, and where?

North Western Ohio at East Toledo.

Columbus and Toledo at East Toledo.

Ohio Central " "

Toledo, Delphos and Burlington at Toledo.

Toledo and Canada Southern over at Toledo.

N. Y., P. & O. over at Franklin.

Number of crossings of highways at grade in this State without protection, 493.

" " " " " at which there are gates or  
flagmen, 37

Number of crossings of highways over railroad, 31.

" " " under railroad, 29.

" highway bridges 18 feet above track, 27

" " " less than 18 feet above track, 4.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated .....	1742; in Ohio.....	697
Miles of same owned by railroad company.....	1076; " .....	621

## STATIONS.

Passenger and freight .....	244; in Ohio.....	80
Number with telegraph communication.....	212; " .....	78
Number of same operated by railroad company .....	212; " .....	78

Is pay received for messages sent over line owned by railroad company? No.

## ROLLING STOCK.

Locomotives .....	502; average weight—lbs.....	81,000
Express and baggage cars.....	80; " .....	35,000
Passenger cars .....	165; " .....	40,000
Parlor, 6, and sleeping cars, 26..	32; " .....	62,000
Freight cars.....	13,941; " .....	16,600
Other cars .....	153; " .....	12,000

Above includes not owned by company reporting.

Parlor and sleeping cars, 32; owned by N. Y. Central Sleeping Car Co.

Terms of service: Sleeping Car Co. owns the cars and maintains the interior, receiving all the revenue from berths and seats.

Number of locomotives equipped with train brakes, 345.

Kind of brake: Westinghouse Air Brake, and steam driver brake.

Number of cars equipped with train brakes: All passenger equipment.

Method of bridging between passenger cars, when two or more are run in trains: Miller Platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Baker and Smith's heaters with hot water pipes in passenger cars; smoking and baggage cars, strong stoves, generally the Winslow Safety Stove.

Means of lighting same: Candles in globes, and lamps burning kerosene of 300° fire test.

## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	30 miles per hour.
Mail and accommodation .....	22 " "
Freight trains .....	12 " "

## EMPLOYES.

Superintendents .....	10
Telegraph operators.....	419
Engineers and firemen .....	1,126
Baggagemen.....	138
Flagmen, switch-tenders and watchmen .....	645
Laborers .....	1,285
Clerks .....	758
Train dispatchers.....	34
Wipers .....	60
Mechanics .....	1,781
Conductors.....	307
Brakemen.....	600
Station Agents .....	211
Section men .....	2,781
Other employees .....	1,187

Total number employed by company in operating line .....	11,342
Proportion for Ohio.....	3,781

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: United States Express Company, and American Express Company.

Terms: The United States pays \$250 per day for messengers, safes, and 16,000 pounds through freight between Cleveland and Chicago, and 20 cents to \$1.25 per hundred for way freight.

The American pays \$168 per day for messengers, safes, and 24,000 lbs. through freight between Cleveland and Buffalo, and 20 to 75 cents per hundred for way freight.

Special freight and transportation lines:

1. Red Line.
2. White Line.
3. South Shore Line.
4. Hoosac Tunnel Line.
5. Midland Line.
6. Merchants' Dispatch.
7. Empire Line.

Terms as to rates, use of track, machinery, repair of cars, etc., with each: Nos. 1, 2, 3, 4 and 5 are co-operative lines, owned by the railroad companies over whose roads they run.

Nos. 6 and 7 are stock companies, and receive the current rate of mileage on cars, and a commission on all freights they secure for the railroad companies.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives	Passenger .....	16	Frogs—2 to 12 months.....		
	Freight .....	15	Ties—Oak .....		9
Cars.....	Passenger .....	15	Bridges.....	Wooden (if properly cov'd and inspect'd)	25
	Baggage.....	12		Trestles—about .....	9
	Box .....	10		Piling “ .....	12
	Stock .....	10	Telegraph poles	Cedar .....	15
	Coal .....	10		Other.....	12
	Flat .....	10	Fence posts .....		9
Rails .....	Iron—all renewals made with steel .....				
	Steel—not used long enough to determine .....				

## RATES OF TRANSPORTATION.

## PASSENGERS.

Depending on distance.

Fare charged per mile :	Highest.	Lowest.	Average.
For distances less than 8 miles .....	3 to 5 Cts.	2½ Cts.	2¾ Cts.
over 8 miles—First class .....	3	¾	1½
Second class .....	2	¾	1
Emigrant .....	1	¾	¾
Excursion .....	2	5/8	1

## FREIGHT.

Rate per 100 lbs. when freight weighs less than a ton :

1st class, 5 cents per 100 lbs. above the rate charged on shipments over one ton.			
2d class, 3 “ “ “ “ “ “	“	“	“
3d class, 2 “ “ “ “ “ “	“	“	“
4th class, 1 “ “ “ “ “ “	“	“	“

Grain—See rates given below.

Rate per ton per mile on freight carried less than 30 miles—First class, second class, third class, fourth class, grain, special class: Does not exceed the rate charged per 100 lbs. for thirty miles.

Rate per ton per mile on freight carried more than 30 miles:

	For 30 miles.	For 200 miles.
First class.....	5 Cts.	4 Cts.
Second class.....	5	3½
Third class .....	5	2¾
Fourth class.....	5	2
Grain .....	4	1½
Special class.....	3 to 5	1½ to 2

## Rate per ton per mile for—

Coal—Carried ten miles or more.....	5	1½
Carried less than ten miles*.....	...	...
Pig iron—Carried ten miles or more.....	5	1½
Carried less than ten miles*.....	...	...
Limestone—Carried ten miles or more.....	5	1½
Carried less than ten miles*.....	...	...
Iron ore—Carried ten miles or more.....	5	1½
Carried less than ten miles*.....	...	...
Undressed stone or lumber—Carried 10 miles or more...	5	1½
Carried less than 10 miles*.....	...	...

Rate per 100 lbs. for loading and unloading—First class, second class, third class, fourth class, fifth class, special class: Included in rates for transportation, except when special car load rate is given on condition that owners shall load and unload.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

## Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length.
Packer Creek.....	Plate girder.....	Iron.....	40 feet.
Toussaint.....	".....	".....	80 "
Muscalonge.....	".....	".....	44 "
Little Mud.....	".....	".....	29 "
Cawles.....	".....	".....	40 "
Little Yankee.....	".....	".....	32 "

Trestles—Length filled and converted into embankment..... 683 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, \$1).. 20.14

In Ohio.

Ballasting—Miles of main track ballasted with gravel and cinders.... 123.54 52.86

Rail laid—Steel, 60 and 65 lbs. per yard—miles of track..... 65.23 18.12

Rerolled iron, used only for switches.

Train mileage—Passenger.....	2,694,364
Freight.....	7,262,957
Construction.....	389,952

Total..... 10,347,273

Car mileage—Passenger..... 10,188,326

Express and baggage..... 6,157,292

Freight—loaded..... 222,134,000

empty..... 44,426,800

Caboose..... 8,885,360

Construction and other..... 9,748,800

Total..... 301,540,578

\* For less than 10 miles the rate per 100 lbs. is same as for 10 miles.



Fuel consumed—Wood, 45,020 cords; coal, 420,608 tons. Total cost..... \$1,065,175 63  
 Losses, etc., paid—On goods and baggage ..... 39,582 14

For injuries in Ohio, fatal and non-fatal:

to passengers, 4 fatal..... \$810 60  
 to employes, 2 fatal and 8 non-fatal ..... 2,480 85  
 to others, 1 non-fatal..... 300 00

Total..... 3,591 45

For animals killed in Ohio:

Horses, 5..... \$458 44  
 Cattle, 24..... 573 52  
 Sheep, 45..... 131 50  
 Hogs, 5 ..... 25 00

Total..... \$1,188 46

Amount claimed in litigation, etc., for injuries in Ohio to persons ..... 25,000 00

#### TRANSPORTATION.

Passengers—Number carried, local..... 3,227,788  
 through ..... 97,079

Total..... 3,324,867

Average number carried in each car per trip ..... 19

Average number of miles traveled by each ..... 57

Total mileage, or number carried one mile ..... 188,693,821

Average amount received for each ..... 117 cents.

Average amount *per mile* received for each ..... 2.063 cents.

Freight—Tons carried, local ..... 7,595,712  
 through ..... 1,092,050

Total ..... 8,687,762

Average tons in each loaded car per trip ..... 8½

Average tons in each loaded car per mile ..... 8½

Total movement, or tons carried one mile..... 1,907,674,353

Average amount received for each ton..... 155½ cents.

Average amount *per mile* received for each ton ..... 0.707 cents.

Average cost per ton freight per mile..... 0.435 cents

Average amount received for each ton through freight ..... \$3 16²

Average amount received for each ton local freight ..... \$1 32²

Articles transported:

	Tons.	Per cent.
Coal .....	1,441,853	16.6
Stone, lime and sand.....	221,701	2.5
Petroleum .....	363,724	4.2
Ores .....	140,964	1.6
Pig and bloom iron .....	223,814	2.6
Manufactured iron.....	471,290	5.4
Lumber and other forest products .....	895,796	10.3



## New York, Penna., Michigan,

Indiana and Illinois ..... 222,143 85

459,300 54

Salaries..... \$111,299 04

Other general expenses of operating.... 478,896 66

590,195 70

Total operating expenses, being 53.37 per cent. of earnings..... \$9,944,455 23

Net earnings of 1,177.67 miles operated..... \$8,686,938 97

## Rentals paid, etc.:

Hire of cars..... \$847,852 08

Rent of tracks, etc..... 85,172 00

" Erie &amp; Kalamazoo R. R..... 30,000 00

" Kalallegan &amp; G. R. R. R..... 103,800 00

" Jamestown &amp; Frank R. R..... 57,883 21

" Mahoning Coal R. R..... 88,659 14

1,213,366 43

Net income over operating expenses and rents paid ..... \$7,473,572 54

Percentage of same to capital stock and debt (\$87,189,000).....8.57

Per cent. of to total means applied to construction, etc. (\$83,240,600) ..8.98

Per mile of earnings..... \$15,820 55; Proportion for Ohio (420.81 miles) \$6,657,266 40

operating expenses 8,444 18; " " " 3,553,277 28

Net earnings ..... \$7,376 37; " " " \$3,103,989 12

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Interest and dividends on assets..... \$237,578 08

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds, (net)..... \$2,629,415 00

Dividends, rate 8 per cent. on general stock..... 3,957,320 00

Last dividend declared on general stock: Aug. 1, 1881.

Dividends, rate 10 per cent. on preferred stock ..... 53,350 00

Last dividend declared on preferred stock: Aug. 1, 1881.

Applied to sinking fund..... 250,000 00

6,890,085 00

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$50,000,000 00	
Funded debt:		
Lake Shore & Michigan Southern.....	35,665,000 00	
Detroit, Monroe & Toledo.....	924,000 00	
Kalamazoo & White Pigeon.....	600,000 00	
Floating debt: None.		
June liabilities, paid in July.....	1,765,484 57	
Dividend, paid Aug. 1 .....	1,016,005 00	
Income account .....	4,876,911 70	
		<hr/> \$94,847,401 27

## ASSETS.

Lake Shore & Michigan Southern R'y.....	\$65,600,000 00	
Equipment .....	14,378,000 00	
Detroit, Monroe & Toledo Railroad.....	1,295,600 00	
Kalamazoo & White Pigeon Railroad .....	610,000 00	
Northern Central Michigan       " .....	1,357,000 00	
Interest in Jamestown & Franklin Railroad .....	2,114,648 56	
"     Chicago & Canada Southern Railroad .....	660,000 00	
Stocks in other companies.....	2,015,629 57	
Bonds       "       " .....	1,143,918 39	
Pacific Hotel Co., Chicago.....	415,712 50	
General office property and other real estate.....	223,595 97	
Supplies—rails, fuel, etc.....	973,785 52	
Cash, cash items and uncollected earnings .....	4,059,510 76	
		<hr/> \$94,847,401 27

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	July 7	Minnie Brokway.....	Not employed.....	Stone thrown through window.....	Face cut.
2	12	P. H. Eddy.....	Brakeman.....	Fell off top of car.....	Wrist sprained.
3	15	H. Stewart.....	Freight conductor.....	Thrown against car.....	Face cut.
4	18	F. Maddox.....	Brakeman.....	Thrown off car.....	Cut and bruised.
5	20	S. Hind.....	Carpenter.....	Fell getting off train.....	Arm broken.
6	31	H. F. Karl.....	Not employed.....	On top coach, struck by bridge.....	Killed.
7	21	Mrs. M. Leopold.....	".....	" " track.....	Killed.
8	27	M. Farron.....	Laborer.....	".....	Died from injuries.
9	28	Unknown.....	".....	Stealing ride.....	Killed.
10	28	J. Vetter.....	Laborer.....	Fell from car.....	Head cut.
11	28	E. Wilson.....	Brakeman.....	Coupling.....	Finger broken.
12	August 4	J. Carmody.....	Watchman.....	Struck by train.....	Killed.
13	5	E. F. Lamore.....	Brakeman.....	Fell from car.....	Badly bruised.
14	7	S. Gardner.....	Not employed.....	On track.....	Collar bone broken.
15	14	J. Cheney.....	".....	Struck by engine.....	Died from injuries.
16	15	J. Horan.....	Pony conductor.....	Coupling cars.....	"
17	15	J. Niles.....	Helper.....	Coupling cars.....	Fingers smashed.
18	18	J. Ruzika.....	Laborer.....	Struck by train.....	Spine injured.
19	20	T. McFall.....	Not employed.....	Jumped from train.....	Legs crushed.
20	23	F. Castle.....	Brakeman.....	Fell off engine.....	Head badly hurt.
21	25	E. Dovyty.....	Not employed.....	Stealing ride.....	Killed.
22	26	J. Nugent.....	Foreman.....	Fell off hand-car.....	Collar bone broken.
24	30	Misses Remington.....	Not employed.....	Struck by train.....	Badly bruised.
25	28	G. C. North.....	".....	".....	Killed.
26	28	F. McCormick.....	Helper.....	Coupling.....	Died from injuries.
27	28	F. Koos.....	Not employed.....	Jumped from train.....	Killed.
28	Sept. 4	F. Longfield.....	".....	Lying on track.....	"
29	7	Unknown man.....	".....	Struck by train.....	"
30	12	C. Clemmens.....	Laborer.....	Sitting on track.....	"
31	15	John Lester.....	Brakeman.....	Coupling.....	Wrist smashed.
32	17	F. Fox.....	".....	Fell from car.....	Back badly hurt.
33	18	J. Monk.....	Engine wiper.....	Crossing track.....	Killed.
34	23	E. Hardy.....	Brakeman.....	Winding bell cord.....	Fingers badly cut.
35	25	T. Shea.....	".....	Coupling.....	Foot sprained ; one bone broken.

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881—Continued.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
36	Sept. 25	K. Carsons.....	Not employed.....	Stealing ride.....	Two toes cut off.
37	26	J. Flynn.....	".....	".....	Arm broken.
38	27	Mrs. C. Sweet.....	".....	Getting off moving train.....	Badly bruised.
39	5	T. Counors.....	".....	On track.....	Killed.
40	8	E. Hammond.....	Helper.....	Foot caught in track—struck.....	Broken leg.
41	12	Unknown man.....	".....	On track.....	Killed.
42	22	M. Conway.....	Not employed.....	".....	"
43	23	F. H. Dady.....	Brakeman.....	Caught by telegraph wire.....	Collar bone broken.
44	27	W. Pease.....	Not employed.....	Caught between cars.....	Foot crushed.
45	30	D. H. Rogers.....	Freight conductor.....	Fell between cars.....	Hip badly hurt.
46	30	W. R. Searls.....	Not employed.....	Struck by train.....	Leg broken; head cut.
47	31	Miss P. Willinger.....	".....	" engine.....	Fingers cut off.
48	31	M. Elliger.....	Laborer.....	On track.....	Killed.
49	3	J. Polite.....	Engineer.....	Train accident.....	Knee fractured.
50	7	R. Taylor.....	Brakeman.....	Fell from car.....	Shoulder sprained.
51	7	J. Wheeler.....	Not employed.....	Stealing ride.....	Skull fractured.
52	10	E. Murphy.....	Brakeman.....	Fell from train.....	Died from injuries.
53	14	F. Henrick.....	Conductor.....	Collision.....	Breast bone broken.
54	15	H. McAninle.....	Hostler.....	Fell from engine.....	Ankle sprained.
55	19	M. Fritz.....	Brakeman.....	Jumped in front of engine.....	Killed.
56	20	J. Donnelly.....	Not employed.....	On track.....	Hand cut off.
57	23	S. Fell.....	Brakeman.....	Coupling.....	Back sprained.
58	24	J. W. Carroll.....	".....	".....	Finger broken.
59	27	D. H. Black.....	".....	".....	Finger broken.
60	27	M. Williams.....	Switchman.....	Struck by engine.....	Severely injured.
61	30	W. G. Peters.....	Helper.....	Coupling.....	Thumb and finger off.
62	7	S. A. Handy.....	Not employed.....	On track.....	Killed.
63	8	T. Hughes.....	".....	Struck by engine.....	Killed.
64	11	J. Farren.....	Brakeman.....	Thrown from car.....	Ankle broken.
65	11	A. B. Russel.....	Freight conductor.....	Train accident.....	Head and arm cut and bruised.
66	12	W. Hayes.....	Brakeman.....	Coupling.....	Two fingers off.
67	15	R. Montgomery.....	".....	".....	Two ribs broken.
68	18	J. Brown.....	".....	Fell from car.....	Ankle sprained.
69	19	T. Galvin.....	".....	Fell between cars.....	Died from injuries.

70	Dec.	19	J. Moran.....	Brakeman.....	Fell from train.....	Badly hurt.
71		20	J. Garrigan.....	".....	Coupling.....	Chest badly squeezed.
72		23	J. Managhan.....	Train agent.....	Fell from train.....	Leg broken.
73		23	J. Reid.....	Brakeman.....	Coupling.....	Badly squeezed.
74		24	H. Brooks.....	Not employed.....	Run over.....	Arm cut off.
75		27	M. O'Conors.....	Target man.....	Struck by engine.....	Killed.
76	Jan.	6	H. W. Gage.....	Brakeman.....	Coupling.....	Two fingers broken.
77		9	G. W. Halsted.....	Fireman.....	Train accident.....	Shoulder dislocated.
78		9	H. E. McMillan.....	Brakeman.....	".....	Back and legs bruised.
79		12	Rolla Spring.....	Not employed.....	Getting on train.....	Killed.
80		13	P. Colter.....	".....	On track.....	Killed.
81		14	W. Taylor.....	Brakeman.....	Coupling.....	Finger broken.
82		14	H. Masterson.....	".....	Brake wheel injured.....	Wrist and knee injured.
83		14	D. B. Morrill.....	Fireman.....	Fell from tank.....	Back injured.
84		30	S. H. Bates.....	Pony conductor.....	Struck by car.....	Spine injured.
85	Feb.	4	W. H. Carter.....	Brakeman.....	Fell from car.....	Back injured.
86		5	W. Pender.....	Yard conductor.....	Struck by engine.....	Badly bruised.
87		10	J. Thompson.....	Brakeman.....	Coupling.....	Collar bone broken.
88		11	P. Manning.....	Not employed.....	Struck by engine.....	Killed.
89		13	Ella Gilbert.....	".....	Struck by train.....	Died from injuries.
90		21	J. Ludwick.....	".....	On track.....	Toes cut off.
91		23	W. Morgan.....	Yard conductor.....	Struck by engine.....	Killed.
92		28	J. Thiede.....	Car repairer.....	Car fell on him.....	"
93	March	1	R. Hayes.....	Not employed.....	Stepped in front of engine.....	"
94		3	H. Holt.....	Car repairer.....	Struck by engine.....	"
95		3	W. Ramacher.....	".....	Poling cars.....	Arm broken.
96		4	J. Coughlin.....	Brakeman.....	Struck by engine.....	Died from injuries.
97		5	L. H. Armstrong.....	Freight conductor.....	Slipped from car.....	Killed.
98		9	James Butler.....	Not employed.....	Struck by engine.....	"
99		11	M. Birch.....	Brakeman.....	Coupling.....	Knee sprained.
100		11	Charles Stump.....	Helper.....	Under cars.....	Died from injuries.
101		12	T. Lynch.....	Switchman.....	Run over.....	"
102		17	G. W. Judd.....	Not employed.....	On track.....	Foot run over.
103		20	J. A. Murphy.....	Brakeman.....	Fell from car.....	Leg broken.
104		22	J. T. Lacey.....	Engineer.....	Train accident.....	Killed.
105		22	C. L. Lockwood.....	Not employed.....	".....	Cut and badly bruised.
106		22	T. H. Stevenson.....	Fireman.....	".....	Killed.
107		22	A. Schneider.....	Not employed.....	Struck by engine.....	Badly bruised.
108		22	J. Clark.....	".....	Train accident.....	"
109		22	B. F. Ash.....	".....	".....	Ribs broken.



## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881—Continued.

○ N	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
110	March 24	R. Collins .....	Brakeman .....	Coupling .....	Killed.
111	26	C. H. Simmons.....	Freight conductor.....	Caught between cars .....	"
112	26	M. Quinlan.....	Not employed.....	Struck by train.....	"
113	29	J. Collins.....	Brakeman .....	Getting off car.....	Ankle sprained.
114	31	P. Tehey .....	Car repairer.....	Run over .....	Died from injuries.
115	April 5	D. Black .....	Brakeman .....	Struck by engine.....	Foot run over.
116	6	W. Murphy.....	" .....	Coupling.....	Thumb off.
117	10	R. A. Campbell .....	Freight conductor.....	Caught in stand rise.....	"
118	11	H. Green.....	Not employed.....	Stealing ride .....	Killed.
119	11	Unknown man .....	" .....	" .....	"
120	12	Charles Wales .....	Brakeman .....	Struck by engine.....	Arm broken.
121	17	Eugene Wilson.....	Laborer .....	Getting off car .....	Ankle sprained.
122	18	W. Closson.....	Not employed.....	Run over by hand-car .....	Leg broken.
123	27	W. Murphy .....	Freight conductor.....	Struck by train.....	Killed.
124	30	F. Neff .....	Brakeman .....	Track gave away .....	Back injured.
125	May 2	F. Williams .....	" .....	Caboose platform broke down.....	Internally injured.
126	2	J. Galbrath.....	Freight conductor.....	Run over .....	Leg cut off.
127	2	R. Gage .....	Not employed.....	Caboose platform broke down.....	Leg fractured.
128	8	T. Campbell .....	" .....	On track.....	Killed.
129	9	D. Baron .....	" .....	Jumping on train.....	"
130	12	M. Hatchell .....	Brakeman .....	Struck by engine.....	"
131	17	T. Goodwin.....	Switchman .....	Fell between cars.....	"
132	23	Charles Hecker.....	" .....	Struck by train.....	Died from injuries.
133	27	M. Kruse.....	Not employed.....	Coupling.....	Fingers broken.
134	30	B. French .....	" .....	Jumped from train.....	Leg broken.
135	June 2	H. Schroeder .....	" .....	Struck by train.....	Shoulder broken.
136	4	J. Harrington .....	" .....	Jumped from train.....	Head bruised.
137	4	W. M'Knight.....	" .....	" .....	"
138	5	G. Englehart .....	" .....	" .....	Badly bruised.
139	12	T. Brennan.....	" .....	" .....	Arm broken.
140	14	J. Delany.....	Laborer .....	Run over .....	Killed.
141	28	J. P. Toomey .....	Brakeman .....	Fell between cars .....	"
142	30	P. Skelly .....	" .....	Coupling.....	Finger off.

## SUMMARY OF ACCIDENTS.

Persons killed—causes.		Passengers.	Employees.	Others..	Total.
Getting on or off engine or train in motion.....				7	7
Falling or thrown from engine or train.....			5		5
Struck by bridge, chute or other obstruction.....				1	1
Collisions, and standing on platform of car during same...			2		2
Coupling, or crushed between cars and engine.....			5		5
Lying, walking, falling, or being on track.....			10	19	29
On hand cars, falling from or struck by engine .....			1		1
Suicide.....			1	1	2
Miscellaneous.....			3		3
Totals.....			27	28	55

Persons injured—causes.		Passengers.	Employees.	Others.	Total.
Getting on or off engine or train in motion.....			5	9	14
Coupling, or caught between cars and engine.....			18		18
Falling or thrown from engine or train.....			13		13
Falling between cars.....			1		1
Lying, walking, falling, or being on track.....			5	15	20
Collisions.....			5	3	8
Run over in yards, on siding or switching.....			1		1
Run over, catching foot in frog or between rails .....			1		1
Breaking of brake rod, chain or wheel in setting.....			1		1
Miscellaneous .....	1		9		10
Totals.....	1		59	27	87

## RECAPITULATION.

Killed—Employees—from causes beyond their control.....	7
misconduct or want of caution.....	20
Others—stealing rides .....	6
trespassing on track, etc.....	22
Total killed.....	55
Injured—Passengers—from causes beyond their control.....	1
Employees—                    “                    “ .....	14
misconduct or want of caution.....	45
Others—stealing rides.....	3
trespassing on track, etc.....	24
Total injured .....	87

## TRAIN ACCIDENTS—OHIO LINE.

*Return of accidents to trains occurring within the year ending June 30, 1881.*

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1880.				
Oct. 15	Toledo .....	Freight.....	Collision .....	Engine damaged.
Nov. 3	" .....	" .....	Derailment.....	Killed fifteen hogs.
10	" .....	" .....	Collision .....	Engine and two cars damaged.
14	Coit's .....	" .....	" .....	Engine and cars damaged.
30	Collins .....	" .....	" .....	Cars damaged.
Dec. 2	Monroeville...	" .....	" .....	Engine disabled.
9	Millbury .....	" .....	" .....	Slight damage.
9	Oberlin .....	" .....	" .....	Cars damaged.
11	Vermillion .....	" .....	" .....	" .....
15	Elyria .....	" .....	" .....	" .....
17	Vermillion..	" .....	" .....	" .....
1881.				
Jan. 22	Norwalk .....	" .....	" .....	Five cars damaged.
15	Oak Harbor .....	" .....	Derailment.....	Two cars destroyed.
Feb. 7	Stryker .....	" .....	" .....	Car damaged.
16	Norwalk .....	" .....	Collision.....	Sixteen cars damaged.
12	" .....	" .....	" .....	Damage slight.
Mch. 22	Nottingham ..	Passenger....	Derailment.....	Engineer and fireman killed; two express messengers badly bruised; mail clerk bruised; no passengers injured; cars and engine damaged about \$5,000.
May 31	Sandusky .....	Freight.....	Collision .....	Two cars wrecked.
June 11	Saybrook .....	" .....	Burned journal,...	Five cars damaged.

## SUMMARY OF TRAIN ACCIDENTS.

Accidents causing derailment of trains.....	4
Accidents not resulting in derailment of train.....	1
Number:	
Collisions—Butting .....	} 14
Crossing .....	
Rear .....	
Total accidents.....	19
Cause of accidents effecting derailment of trains:	
Broken wheel.....	1
Loose switch.....	1
Unexplained .....	1
Other causes.....	1
Total .....	4
Causes of collisions:	
Orders—absence of, mistake in, neglect or disobedience to.....	5
Signals—failure to use, or absence of.....	2
Train breaking in two.....	4
Unexplained .....	1
Other causes.....	2
Total.....	14
Causes of accidents not resulting in derailment of trains:	
Car burned while running.....	1
Total accidents.....	19

*State of Ohio, County of Cuyahoga, ss. :*

John Newell, General Manager of the Lake Shore and Michigan Southern Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed)

JOHN NEWELL.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 27th day of August, A. D. 1881.

NICHOLAS BARTLETT;

[SEAL.]

*Notary Public.*

## LAWRENCE RAILROAD COMPANY.

Name of road : Lawrence Railroad.  
 By whom owned : Lawrence Railroad Company.  
 By whom operated : Pennsylvania Railroad Company.  
 By what authority : Lease.  
 Name of person making this report : F. M. Hutchinson, Secretary and Treasurer Lawrence Railroad Company.  
 General office at Pittsburgh, Pa.  
 Address correspondence relating to this report to F. M. Hutchinson, Secretary, Pittsburgh, Pa.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Thomas D. Messler .....	President .....	Pittsburgh, Pa.....	.....
F. M. Hutchinson.....	Secretary and Treasurer...	" .....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Thos. D. Messler .....	Pittsburgh, Pa..	A. L. Crawford .....	New Castle, Pa..
Geo. W. Cass.....	" ..	R. W. Cunningham .....	" ..
J. N. McCullough.....	" ..	J. D. Layng.....	Pittsburgh, Pa..
John B. Jackson ... ..	" ..		

### CAPITAL STOCK.

Capital stock authorized by law—Amount—common.....	\$500,000 00
Number of shares—common.....	10,000
Par value of each—common.....	\$50 00
Capital stock—Amount subscribed—common.....	450,000 00
Total paid in capital stock—common.....	450,000 00
Average amount paid in per mile of single main track (22.04 miles).....	20,417 42
Proportion of same for Ohio (12.68 miles).....	258,892 88

Capital stock issued, and on what account, as follows :

On what account.	Number shares.	Amount of common.
For original construction .....	6,900	\$345,000
For construction on extension of line or branches.....	2,000	100,000
For bonds of company canceled.....	100	5,000
Total.....	9,000	\$450,000

Stockholders, residents of Ohio, 10.

Amount of stock held by them June 30, 1881, \$12,550.

Agents authorized to transfer stock: F. M. Hutchinson, Secretary and Treasurer  
196 Smithfield street, Pittsburgh, Pa.

Number of shares transferred within the year at such agencies, 501.

#### FUNDED DEBT.

1. Kind of bond or oblig'tions.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....		Aug. 1865...	Aug. 1895...	7	.....	\$355,000

Average amount per mile of single main track (17.98 miles), on part mortgage .....	\$19,744 15
Proportion of same for Ohio (8.62 miles).....	170,194 66
Amount in hands of trustees of sinking fund for redemption. ....	28,537 50

#### OTHER INDEBTEDNESS.

Total unfunded debt.....	\$1,674 60
Cash securities, debit balances, etc., available to payment.....	37,435 56
Net surplus, exclusive of sinking fund .....	35,760 86
Total of paid in stock and debt .....	805,000 00
Total average amount per mile.....	40,161 58
Proportion of same for Ohio.....	429,087 54

#### COST OF ROAD EQUIPMENT, Etc.

##### CONSTRUCTION ACCOUNT.

Total expenditures for construction: Prior to July 1, 1880, \$803,058.35; for the year ending June 30, 1881, \$3,859.37; total expenditures to July 1, 1881, \$806,917.72.	
Total expended by company for construction.....	\$806,917 72
Average cost per mile of road constructed (single main track, 22.04 miles)	36,611 51
Proportion of same for Ohio (12.68 miles).....	464,233 95
66 R.R.C.	

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Lawrence Junction, Pa., to Youngstown, O.....	17.98	8.62
Hazelton, O., to Canfield Coal Mines, O.....	4.06	4.06
Total single main track.....	22.04	12.68
Aggregate of sidings and other tracks.....	3.22	1.07
Total length laid with rail computed as single track.....	25.26	13.75

Length in Ohio, distributed as follows:

Mahoning county, main track, 8.62; branches, 4.06; sidings, etc., 1.07; total, 13.75.

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Rental from lease .....	\$73,359 87	
Sale of bonds.....	1,200 00	
Interest on bonds owned by company .....	1,225 00	
Interest on stock owned by company .....	504 12	
		\$76,288 99

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$25,990 00	
Dividends, rate 8 per cent. on general stock ..	36,000 00	
Last dividend declared on general stock, June 30, 1881.		
Stock investment.....	1,251 25	
Applied to sinking fund.....	1,775 00	
Old claims chargeable to construction.....	3,859 37	
Commonwealth of Pennsylvania, taxes .....	1,096 97	
General expenses.....	2,706 20	
		\$72,678 99

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1880.

## LIABILITIES.

Capital stock .....	\$450,000 00	
Mortgage bonds .....	355,000 00	
Sundry accounts.....	666 00	
Coupons unpaid .....	805 00	
Pennsylvania Co.....	187 19	
Commonwealth of Pa.....	16 41	
Balance to income account.....	66,216 18	
		\$872,890 78



## ASSETS.

Construction account .....	\$806,917 72	
Sinking fund .....	27,167 50	
Bond investment .....	16,795 83	
Thos. D. Messler, Trustee .....	1,370 00	
Winslow Lanier & Co.....	980 00	
Cash in hands of Treasurer .....	16,240 98	
Stock investment.....	3,418 75	
		————— \$872,890 78

*State of Pennsylvania, County of Allegheny, ss.:*

Thos. D. Messler, President of the Lawrence Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

THOS. D. MESSLER,

[SEAL OF R. R.]

*President.*

Subscribed and sworn to before me, this 9th day of September, A.D. 1881.

FRANK SEMPLE,

[SEAL]

*Notary Public.*

# PENNSYLVANIA COMPANY OPERATING LAWRENCE RAIL-ROAD.

Name of road: Lawrence Railroad.

By whom owned: Lawrence Railroad Company.

By whom operated: Pennsylvania Company.

By what authority: Lease.

Name of company making this report: Pennsylvania Company operating Lawrence Railroad.

General office at Pittsburgh.

Address correspondence relating to this report to J. P. Farley, Auditor, Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS OF PENNSYLVANIA COMPANY OPERATING.

Name.	Office.	Address.	Salary.
G. B. Roberts.....	President .....	Philadelphia, Pa.....	.....
J. N. McCullough .....	1st Vice President.....	Pittsburgh, " .....	.....
Wm. Thaw.....	2d " .....	" " .....	.....
Thos. D. Messler.....	3d Vice Pres. and Compt'r	" " .....	.....
John E. Davidson .....	Assistant Comptroller .....	" " .....	.....
S. B. Liggett.....	Secretary .....	" " .....	.....
S. W. White.....	Assistant Secretary.....	Philadelphia, " .....	.....
W. H. Barnes .....	Treasurer .....	Pittsburgh, " .....	.....
J. P. Farley .....	Auditor .....	" " .....	.....
D. W. Caldwell.....	General Manager.....	" " .....	.....
Wm. A. Baldwin .....	Manager.....	" " .....	.....
J. P. Brooks .....	General Counsel.....	" " .....	.....
F. Slataper .....	Chief Engineer.....	" " .....	.....
E. A. Ford .....	Gen. Pass'ger & Ticket Agt..	" " .....	.....
Wm. Stewart.....	General Freight Agent .....	" " .....	.....
J. N. McCullough.....	Executive Committee {	" " .....	.....
Wm. Thaw.....		" " .....	.....
Thos D. Messler .....		" " .....	.....
Jno. P. Green .....		Philadelphia, Pa .....	.....
W. H. Barnes .....		Pittsburgh, Pa .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
George B. Roberts.....	Philadelphia, Pa	Henry M. Phillips .....	Philadelphia, Pa.
J. N. McCullough .....	Pittsburgh, Pa...	J. N. DuBarry .....	"
Wm. Thaw.....	" .....	J. P. Wetherill .....	"
Thos. D. Messler .....	" .....	A. J. Cassatt .....	"
Henry H. Houston.....	Philadelphia, Pa	John P. Green.....	"
Wistar Morris.....	" .....	W. H. Barnes.....	Pittsburgh, Pa.
Sam'l M. Felton.....	" .....		

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Lawrence Junction, Pa., to Youngstown, O....	17.98	8.62
Canfield Branch and Canfield Junction to Foster Coal Mines .....	4.06	4.06
Total single main track.....	22.04	4.06
Aggregate of sidings and other tracks.....	3.281	1.125
Total length laid with rail computed as single track.....	25.321	13.805
Laid with steel rail.....	8.93	.13

Length in Ohio, distributed as follows:

Mahoning county, main track, 8.62; branches, 4.06; sidings, etc., 1.125; total, 13.805.

Steel rail, main track, 0.13.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge—Four feet 9 in.	
Grade—Maximum, per mile.....	31 feet.
Longest maximum.....	6,500 "
Aggregate length of maximum.....	6,500 "
Curvature—Shortest radius .....	129,758 ft. 4° 25' curve.
Aggregate length of shortest radii .....	1,376 feet.
Rail—Iron—On road.....	16.29 miles.
Average weight per yard.....	60 lbs.
Steel—On road .....	8.93 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile .....	2,816
Number laid during the year.....	15,615
Ballasted—On whole line .....	22.04 miles.
In Ohio .....	12.68 "
With cinder and gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	3;	greatest age....	7 years;	aggregate length, ft..	369
Iron.....	1;	"	2	"	44
Stone arch	1;	"	...	"	30
Total.....					443
Length of shortest span of truss, 40 ft.; of longest, 102 ft.; greatest length of beams between points of support, if not trussed, iron, 19; wood, 14 feet					
Greatest space between cross ties upon bridges and trestles, 6 inches; length of ties, 9 feet 6 in.					

Number of track-stringers, 6 inches in wooden bridges, 2 inches in iron bridges with iron stringers.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Once a week by bridge foreman, and semi-annually by inspectors.

Are the examinations analytical, and are they made by a competent person? Yes.

#### FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	12	12
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.00) .....	12	12
Cost of fencing .....	\$3,840 00	\$3,840 00
Average cost of same per rod.....	1 00	1 00
Length of road unfenced, and the reason therefor: Road is all fenced, except in Pennsylvania, where railroad companies are not required to fence.		

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

N. Y., Penna. & Ohio R. R. at Youngstown, O.

Pittsburgh & Lake Erie R. R. at Hazelton and Youngstown.

Number of crossings of highways at grade in this State without protection, 10.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated.....	18; in Ohio, 8
Miles of same owned by railroad company, owned jointly with W. U. Tel. Co.....	18; " 8

##### STATIONS.

Passenger and freight.....	5; in Ohio, 3
Number with telegraph communication.....	4; " 3
Number of same operated by railroad company.....	4; " 3
Is pay received for messages sent over line owned by railroad company? For all except railroad business.	

#### ROLLING STOCK.

Locomotives .....	8; Average weight.....	64,370 lbs.
Express and baggage cars.....	5; " .....	29,000 "
Passenger cars .....	8; " .....	41,000 "
Freight cars .....	250; " .....	18,000 "

Above includes not owned by company reporting.

Locomotives.....	8; owned by P., Ft. W. & C. R'y.
Express and baggage cars.....	5; " "
Passenger cars.....	8; " "
Freight cars.....	250; " "
Terms of service: Locomotives, average cost per mile run and 6 % interest on value of same; freight, $\frac{3}{4}$ cent per mile run; passenger, express and baggage cars, 1 $\frac{1}{2}$ cents per mile run.	
Number of locomotives equipped with train brakes, 3.	
Kind of brake: Westinghouse automatic air brake.	
Number of cars equipped with train brakes, 13.	
Kind: Westinghouse automatic air brake.	
Number of passenger cars with Miller Platform: None.	
Method of bridging between passenger cars, when two or more are run in trains: By close connecting platforms joined together with Janney car couplers.	
Are all cars run on this road heated and lighted as prescribed by law? Yes.	
State methods of heating cars used for the transportation of passengers: By Dripps' and Spear's and Bissell's safety stoves.	
Means of lighting same: By candles and safety oil lamps.	

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation.....	20 "
Freight trains .....	15 "

## EMPLOYES.

Superintendent.....	1
Telegraph operators .....	8
Engineers.....	7
Baggagemen .....	3
Flagmen, switch-tenders and watchmen .....	2
Laborers .....	5
Clerks.....	3
Train dispatchers.....	1
Firemen.....	7
Wipers.....	5
Conductors.....	26
Brakemen.....	39
Station agents .....	4
Section men.....	54
Other employees .....	6

Total number employed by company in operating line.....	171
Proportion for Ohio.. ..	127

EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union Express Co.

Terms: 40 % of gross receipts from general merchandise and money business, and  
70 % of gross receipts from oyster business.

Special freight and transportation lines: None except Union Line, owned by Pennsylvania Company.

AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives.....	Passenger.....	16	Joint Fastenings.....		12
	Freight.....	15	Frogs.....		1
Cars.....	Passenger.....	12	Ties—Oak.....		6
	Baggage.....	12	Bridges.....	Wooden.....	9
	Box.....	10		Iron.....	15
	Stock.....	10		Trestles.....	6
	Coal.....	8		Piling.....	6
Rails.....	Flat.....	8	Telegraph poles—Cedar.....		12
	Iron.....	5	Fence posts.....		8
	Steel.....	9			

RATES OF TRANSPORTATION.

PASSENGERS.

Fare charged per mile—		Highest.	Lowest.	Average.
For distances less than 8 miles.....		4 Cts.	3 Cts.	3½ Cts.
For distances over 8 miles—1st class.....		3	2	2½
2d class.....		2	1	1½
Emigrant.....		2	1	1½
Excursion.....		2	1	1½

FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class.....	.024 Cts.	.00778 Cts.	.0084 Cts.
Second class.....	.024	.00722	
Third class.....	.024	.00667	
Fourth class.....	.020	.00611	
Fifth class.....	.016	.20500	

Rate per ton per mile on freight carried less  
than 30 miles:

First class.....	.48	.15555	} .01609
Second class.....	.48	.14444	
Third class.....	.48	.13333	
Fourth class.....	.40	.12222	
Fifth class .....	.32	.10000	

Rate per ton per mile on freight carried more  
than 30 miles: Road is less than 30 miles.

Rate per ton per mile for (9 miles whole dis-  
tance in Ohio)—

Coal—Carried less than ten miles.....	.18	.05555	} .01609
Pig iron—Carried less than ten miles .....	.20	.05555	
Limestone—Carried less than ten miles.....	.18	.05555	
Iron ore—Carried less than ten miles.....	.18	.05555	
Undres'd stone or lumber—Carried less than 10 mi.	.20	.05555	

Rate per 100 lbs. for loading: No charge made for loading.

Rate per 100 lbs. for unloading: No charge made for unloading.

#### DOINGS OF THE YEAR ENDING JUNE 30TH.

Fencing in Ohio—Miles of single fence built, all built.

Ballasting—Miles of main track ballasted, with cinders, 3; in Ohio, 1.

Rail laid—Steel, 60 lbs. per yard—miles of track, 10; in Ohio, 2.

Train mileage—Passenger.....	28,734	
Freight .....	48,698	
Switching, passenger .....	1,878	
freight .....	52,652	
	<hr/>	54,410
Construction .....	3,977	
Total .....		135,819
Car mileage—Passenger.....	47,699	
Express and baggage.....	26,879	
Freight—loaded.....	795,980	
empty.....	298,090	
Caboose .....	39,237	
	<hr/>	
Total .....		1,207,885
Fuel consumed—Wood, 310 cords; coal, 4,135 tons. Total cost .....		\$6,667 50
Losses, etc., paid—On goods and baggage .....		78 89
For animals killed in Ohio—		
2 horses.....	\$191 63	
4 cattle .....	125 00	
	<hr/>	
Total .....		\$316 63



## TRANSPORTATION.

Passengers—Number carried, local .....	37,699	
Average number carried in each car per trip.....	9.64	
Average number of miles traveled by each.....	12.2	
Total mileage, or number carried one mile .....	460,106	
Average amount received for each.....	33.6 cents.	
Average amount <i>per mile</i> received for each .....	2.7	"
Freight—Tons carried, local and through ..	709,672	
Average tons in each loaded car per trip.....	13.1	
Average tons in each loaded car per mile.....	13.1	
Total movement, or tons carried one mile.....	10,432,594	
Average amount received for each ton.....	23.658 cents.	
Average amount <i>per mile</i> received for each ton.....	01.600	"
Average cost per ton freight per mile.....	$\frac{7.34}{1000}$	"
Average amount received for each ton local freight.....	23.658	"
Average cost each ton local freight.....	$\frac{7.34}{1000}$	"
Articles transported:	Tons.	Per cent.
Coal .....	230,699	32.51
Coke.....	139,528	19.67
Stone, lime, sand, etc.....	92,955	13.05
Petroleum .....	214	00.03
Ores .....	165,113	23.27
Pig and bloom iron.....	29,275	04.13
Manufactured iron .....	14,551	02.06
Lumber and other forest products. ....	3,286	00.46
Grain, flour, and other agricultural products.....	3,892	00.55
Live stock.....	6,093	00.86
Animal products .....	1,804	00.26
Manufactures, including agricultural implements ...	12,066	01.70
Merchandise .....	4,549	00.65
Miscellaneous .....	5,641	00.80
Total tonnage yielding revenue .....	709,672	100.
Supplies for company's use.....	7,270	

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local.....	\$12,782 18
Freight transportation—local.....	167,895 10
Mail service.....	991 35
Express service .....	3,130 00
Other sources .....	488 18
Total earnings of line operated included in this report.....	\$185,286 81

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$36,250 10
Maintenance of cars .....	211 19
Motive power.....	22,560 71
Conducting transportation .....	40,110 17
General expenses:	
Taxes in Ohio.....	\$1,265 71
“ Pennsylvania .....	954 11
Salaries .....	858 58
Other general expenses of operating.....	1,594 50
	<u>4,672 90</u>

Total operating expenses, being 56.02 per cent of earnings.....	\$103,805 07
Net earnings of 22.04 miles operated .....	81,481 74
Rentals paid:	
Amount paid Lawrence R. R. Co., being 40 % of gross earnings .....	74,114 71
Net income of operating expenses and rents paid .....	7,367 03
Percentage of same to capital stock and debt, $\frac{0.91}{1000}$ %.	
Per mile of earnings, \$8,406.84; proportion for Ohio (12.68 miles).....	106,598 73
Per mile of operating expenses, \$4,709 84; proportion for Ohio (12.68 miles).....	59,720 77
Per mile of net earnings, \$3,697.00; proportion for Ohio (12.68 miles)....	46,877 96

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880. Aug. 29	Wm. Brown .....	Unknown ..	Lying on track drunk, run over.....	Killed.
2	1881. Apr. 26	Wm. Little .....	“ ..	Walking on track, run over by car.....	Killed.
3	26	Nathan Lynn .....	“ ..	Walking on track, run over by car .....	Killed.
4	29	J. Perry .....	Brakeman ..	Caught while coup- ling .....	3 fingers crush'd.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Others—Lying, walking, falling, or being on track.....	3
Total .....	<u>3</u>

## PERSONS INJURED—CAUSES.

Employees—Coupling, or caught between cars and engine.....	1
Total .....	<u>1</u>

## RECAPITULATION.

Killed—Others—trespassing, on track, etc..	3
Total killed	3
Injured—Employees—misconduct or want of caution.....	1
Total injured.....	1

## TRAIN ACCIDENTS—ENTIRE LINE.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1880.				
Aug. 5	Seymour, Pa.....	Freight.....	Rails spreading.....	Four cars off track.
Sept. 24	Hilltown, Pa.....	" .....	Train breaking—parts coming together.....	Two cars broken.
Oct. 30	Lawrence Junction, Pa..	" .....	Train breaking—parts coming together.....	Three cars broken.
Dec. 3	Hazelton, Pa.....	" .....	Broken axle.....	One car off track.
1881.				
Feb. 8	Youngstown, Ohio.....	" .....	Rail taken out by workmen.....	Engine and 3 cars off track.
April 27	Covert's Mills, Pa.....	" .....	Train breaking—parts coming together.....	One car off track.

## SUMMARY OF TRAIN ACCIDENTS.

Number:	
Accidents causing derailment of trains.....	4
Accidents not resulting in derailment of train.....	2
Total accidents.....	6
Causes of accidents effecting derailment of trains:	
Broken axle.....	1
Snow .....	1
Other causes.....	2
Total .....	4
Causes of accidents not resulting in derailment of trains:	
Other causes.....	2
Total derailments.....	4
Total accidents.....	6

*State of Pennsylvania, county of Allegheny, ss.:*

Thos. D. Messler, Third Vice-President of the Pennsylvania Company, operating the Lawrence Railroad, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)  
[SEAL OF R. R.]

THOMAS D. MESSLER,  
Third Vice-President.

Subscribed and sworn to before me, this 9th day of September, A. D. 1881.

[SEAL.]

FRANK SEMPLE,  
Notary Public.

## LITTLE MIAMI RAILROAD COMPANY

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Name of road: Little Miami Railroad.

By whom owned: Little Miami Railroad Company.

By whom operated: Pittsburgh, Cincinnati, and St. Louis Railway Company.

By what authority: Lease.

Name of person making this report: S. E. Wright, Treasurer of the Little Miami Railroad Company.

General office at Cincinnati, Ohio. (No other office).

Address correspondence relating to this report to S. E. Wright, Treasurer, at Cincinnati, Ohio. (P. O. box 28).

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Little Miami Railroad Company was incorporated by an act of the Legislature, passed March 11, 1836. A copy of the charter and amendments is furnished herewith. No change of name or consolidation with any other company has ever taken place. The main line, from Cincinnati to Springfield—84 miles—was finished and put in operation in August, 1846. The Dayton, Xenia and Belpre Railroad—a line of sixteen (16) miles (first opened in 1854)—became, by purchase, January 4, 1865, a branch of the Little Miami Railroad, known as the "Dayton and Xenia Branch." This report embraces the above main line and branch, 100 miles.

The Little Miami Company formerly held, by perpetual lease, the Columbus and Xenia Railroad (from Columbus to Xenia, 55 miles), and the Dayton and Western Railroad (from Dayton to Richmond, Indiana, 57 miles), but on the first of December, 1869, assigned these leases, and at the same time leased its own road and branch in perpetuity to the Pittsburgh, Cincinnati and St. Louis Railway Company, which now holds and operates all said lines.

As the Little Miami Company does not operate a line of road, nor its "President, or other officer" have "charge of any railroad," it may be doubted whether the law (see section 251) requires any report from us. Still, I have filled the following blank forms with the answers to all questions which seem to be applicable to the condition of our company. This report, however, includes nothing pertaining to the opera-

tion or characteristics of the lines formerly held by us Some explanation is proper as to parts of the following statements :

1st, as to page 5. It is impossible to state the amounts of the different sources out of which the capital stock of this company arose, or even an approximation to them. To do so, if it could be done at all, which I doubt, would require an investigation of account books and records back through a period of forty years, and weeks, perhaps months, of labor. Neither the books nor the labor are at my disposal for this purpose.

2d, as to page 6. The decrease of the funded debt is given as \$12,-000. This is a balance (paid since June 30, 1880,) of a loan, from the city of Cincinnati, of \$100,000, made in 1844.

3d, as to pages 7 and 8. Neither the construction or equipment accounts of this company have been kept so as to show the items specified.

4th, as to page 18. As to the Columbus and Xenia road and the Dayton and Western, the arrangement (as a matter of convenience) between our company and its lessee company is, that the lessee pays over to us the rental and interest on the bonds of the C. & X. Co. and the interest on the bonds of the D. & W. Co. (which is the only rental of this road proper), also the rental of the Richmond and Miami road, which lies in Indiana, and is part of the D. & W. We pay the whole of these funds over to the parties entitled to them; and as they appear on our books, they are included in the statement of receipts and expenditures. The interest on the L. M. bonds is received and paid out by us in the same way. (The D. W. bonded debt is the same as given in our last report).

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary
Hugh J. Jewett.....	President .....	New York .....	.....
Henry Hanna .....	Vice President.....	Cincinnati.....	.....
Julius Dexter .....	Secretary .....	" .....	.....
S. E. Wright.....	Treasurer.....	" .....	\$2,500
Henry Hanna .....	} Executive Committee.. }	" .....	.....
Julius Dexter .....		" .....	.....
L. B. Harrison.....		" .....	.....
		" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
A. D. Bullock .....	Cincinnati .....	L. B. Harrison.....	Cincinnati.
Louis Ballauf .....	" .....	H. J. Jewett.....	New York.
C. P. Casilly.....	" .....	Joseph Longworth.....	Cincinnati.
W. H. Clement.....	" .....	T. D. Messler.....	Pittsburgh, Pa.
Julius Dexter .....	" .....	J. H. Rogers.....	Cincinnati.
Henry Hanna.....	" .....	Jos. R. Swan.....	Columbus.

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$5,000,000 00
Number of shares—common.....	100,000
Par value of each—common.....	\$50 00
Capital stock authorized by vote of Company—common .....	4,637,300 00
Total paid in capital stock—common.....	4,637,300 00
Average amount paid in per mile of single main track (100 miles).....	46,237 00
Capital stock issued, and on what account, as follows: No. shares, 92,746; amount of common .....	4,637,300 00
Stockholders, residents of Ohio, 712.	
Amount of stock held by them June 30, 1881.....	3,155,050 00
Agent authorized to transfer stock: S. E. Wright, Treasurer, Cincinnati, Ohio.	
Number of shares transferred within the year at such agencies, 11,298.	

## FUNDED DEBT.

Kind of bond or obligations, bonds; if and how secured, mortgage; date of issue, May 2, 1853; when due, May 2, 1883; rate of interest, 6 per cent.; amount of authorized issue, \$1,500,000; amount actually issued, \$1,500,000.	
Average amount per mile of single main track (100 miles) .....	\$15,000 00
Decrease since June 30, 1880 .....	12,000 00
Supplies applicable to redemption.....	144,705 28

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$62,105 55
Cash securities, debit balances, etc., available to payment.....	65,715 83
Total of paid in stock and debt—Stock, \$4,637,300; bonds, \$1,500,000....	6,137,300 00
Total average amount per mile .....	61,373 00

## COST OF ROAD EQUIPMENT, ETC.

## CONSTRUCTION ACCOUNT.

Total expenditures for construction: Prior to July 1, 1880.....	\$4,850,084 24
---	----------------

## ROAD ACQUIRED BY PURCHASE.

Dayton & Western Branch (original cost, \$600,000, estimated) purchased for.....	\$412,825 12
Total expended for construction and purchase .....	5,262,909 36
Average cost per mile of road constructed (single main track, 84 miles)	57,739 10
Average cost per mile of road owned by company (single main track, (100 miles).....	52,629 09
Proportion of same for Ohio, all in Ohio.	

## COST OF EQUIPMENT OWNED BY COMPANY.

This company owns no equipment or rolling stock. But our accounts show the total value or cost of our equipment, etc., at the time it was turned over to the lessee.	
Total cost of railroad equipment owned by company at the time of lease to P. C. & St. L. Co.....	\$974,390 64
Average amount per mile (of single main track, 100 miles) .....	9,743 90
Total for road and equipment .....	6,237,300 00
Total average amount per mile (of single main track, 100 miles) .....	62,373 00

## OTHER ITEMS CHARGED TO PERMANENT INVESTMENT.

Little Miami bonds of 1883, par value, \$7,000.....	\$7,212 50
Cincinnati street connection bonds, par value \$44,000.....	33,882 50
	<hr/>
	\$41,095 00
Average per mile (of single main track, 100 miles) .....	410 95

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

From lessee—Rental of L. M. Road and D. & X. Branch..	\$390,448 00
Columbus & Xenia Road and Richmond & Miami .....	148,396 00
Interest on Little Miami bonds .....	89,426 38
Interest on Col. & Xenia and Dayton & Western bonds.....	51,160 00
Commissions on coupons (all kinds) .....	687 65
Income on investments.....	2,769 00
	<hr/>
	\$682,887 03

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net)—Little Miami .....	\$89,426 38
Columbus & Xenia and Dayton & Western .....	51,160 00
Premiums and commissions for paying coupons.....	687 65
Dividends, rate 8 per cent., on general stock .....	370,976 00
Last dividend declared on general stock: June 10, 1881.	
Bonds of company canceled (par value, \$12,000).....	12,000 00



Increase of surplus .....	7,025 62	
Rental of Columbus & Xenia Road .....	142,896 00	
Richmond & Miami Road.....	5,500 00	
All other payments.....	3,215 38	
		<hr/>
		\$682,887 03

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Capital stock issued.....	\$4,637,300 00	
Mortgage bonds, 6 %, due 1883.....	1,500,000 00	
		<hr/>
		\$6,137,300 00
Unpaid coupons not presented, viz.:		
Little Miami .....	\$38,866 76	
Dayton and Western.....	13,815 91	
Columbus and Xenia.....	367 96	
Unclaimed dividends .....	8,796 00	
Due commission funds.....	258 92	
		<hr/>
		62,105 55
Balance to credit of income account—surplus.....		144,705 28
		<hr/>
Total.....		\$6,344,110 83

## ASSETS.

Cost of road equipment, etc., as follows:

Construction .....	\$4,850,084 24	
Equipment.....	974,390 64	
Dayton and Xenia Branch.....	412,825 12	
		<hr/>
		\$6,237,300 00
Bonds of L. M. R. R. Co. of 1883 (par, \$7,000), cost..	\$7,212 50	
Bonds of Cin. Street Connec'n R'y (par, \$14,000), cost	33,882 50	
		<hr/>
		41,095 00
Cash at Am. Ex. Nat. Bank, N. Y., for coupons .....	\$38,245 15	
Cash at Bank of America, .....	11,196 93	
Cash in hands of Treasurer.....	16,273 75	
		<hr/>
		65,715 83
		<hr/>
Total.....		\$6,344,110 83

*State of Ohio, County of Hamilton, ss.:*

S. E. Wright, Treasurer of the Little Miami Railroad Company, being duly sworn, deposes and says that the foregoing statements have been prepared by him from the books and accounts in his charge, and that said statements are a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

S. E. WRIGHT,

(SEAL OF R. R.)

*Treasurer of the Little Miami R. R. Co.*

Subscribed and sworn to before me, this 26th day of July, A. D. 1881.

(SEAL)

L. S. COTTON,

*Notary Public, Hamilton County, O.*

# PITTSBURGH, CINCINNATI AND ST. LOUIS RAILWAY COMPANY OPERATING LITTLE MIAMI RAILROAD.

Name of road: Little Miami Railroad.

By whom owned: Little Miami Railroad Company.

By whom operated: Pittsburgh, Cincinnati and St. Louis Railway Company.

By what authority: Lease.

Name of company making this report: Pittsburgh, Cincinnati and St. Louis Railway Company.

General office at Pittsburgh, Pa.

Principal office in Ohio at Columbus, Ohio.

Address correspondence relating to this report to J. W. Renner, Auditor, at Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS OF LESSEE COMPANY.

Name.	Office.	Address.	Salary.*
George B. Roberts.....	President.....	Philadelphia, Pa.....	.....
J. N. McCullough.....	1st Vice President.....	Pittsburgh, Pa.....	.....
Wm. Thaw.....	2d " ".....	" ".....	.....
Thos. D. Messler.....	3d " and Comptroller.....	" ".....	.....
Jno. E. Davidson.....	Assistant Comptroller.....	" ".....	.....
M. C. Spencer.....	Treasurer.....	" ".....	.....
John W. Renner.....	Auditor.....	" ".....	.....
D. W. Caldwell.....	General Manager.....	" ".....	.....
S. B. Liggett.....	Secretary.....	" ".....	.....
S. W. White.....	Assistant Secretary.....	Philadelphia, Pa.....	.....
M. J. Becker.....	Chief Engineer.....	Pittsburgh, Pa.....	.....
E. A. Ford.....	General Passenger Agent.....	" ".....	.....
Wm. Stewart.....	General Freight Agent.....	" ".....	.....
F. H. Kingsbury.....	Assistant Gen'l Freight Agt.....	Columbus, Ohio.....	.....
J. N. McCullough.....	} Executive Committee..	Pittsburgh, Pa.....	.....
Wm. Thaw.....		" ".....	.....
Thos. D. Messler.....		" ".....	.....
John P. Green.....		Philadelphia, Pa.....	.....
Wm. H. Barnes.....		Pittsburgh, Pa.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Geo. B. Roberts.....	Philadel'ia, Pa..	J. P. Wetherill.....	Philadel'ia, Pa.
J. N. McCullough.....	Pittsburgh, Pa..	Wm. H. Barnes.....	Pittsburgh, Pa.
Wm. Thaw.....	"	D. S. Gray.....	Columbus, O.
Thos. D. Messler.....	"	R. Sherrard, Jr.....	Steubenville, O.
H. H. Houston.....	Philadel'ia, Pa..	A. J. Cassatt.....	Philadel'ia, Pa.
Wistar Morris.....	"	Jno. P. Green.....	"
J. N. DuBarry.....	"		

\* The salaries paid these officers are general in their character or nature, and are applicable to all the lines operated by this company.

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cincinnati, O. to Columbus, O.....	119.35	119.35
Xenia, O., to Springfield, O.....	19.37	19.37
Xenia, O., to Dayton, O., and Dayton, O., to Richmond, Ind.....	57.42	53.23
<hr/>		
Total single main track .....	196.14	191.95
Double track, Foster, O., to Cincinnati, O .....	25.49	25.49
Aggregate of sidings and other tracks .....	30.10	29.14
<hr/>		
Total length laid with rail computed as single track .....	251.73	246.58
Laid with steel rail .....	115.55	115.55

Length in Ohio distributed as follows :

County.	Main track.	Branches.	Double track.	Sidings, etc.	Total.
Franklin .....	13.00	.....	.....	4.47	17.47
Madison .....	19.04	.....	.....	2.11	21.15
Clarke .....	9.66	7.85	.....	1.89	19.40
Greene .....	22.30	22.75	.....	5.60	50.65
Warren .....	32.27	.....	4.00	2.51	38.78
Clermont.....	6.15	.....	6.15	.73	13.03
Hamilton .....	16.93	.....	15.34	7.83	40.10
Montgomery .....	.....	22.50	.....	2.99	25.49
Preble .....	.....	19.50	.....	1.01	20.51
<hr/>					
Total.....	119.35	72.60	25.49	29.14	246.58
Steel rail .....	115.55	.....	.....	.....	115.55

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge, 4.75 feet.	
Grade—Maximum, per mile .....	97.68 feet.
Longest maximum .....	200.00 feet.
Aggregate length of maximum.....	200.00 feet.
Curvature—Shortest radius .....	790.81 feet.
Aggregate length of shortest radius.....	1,581.62 feet.
Aggregate length of all curves.....	63.04 feet.
Aggregate length of tangent.....	133.10 mi.
Rail—Iron—On road.....	138.90 mi.
Average weight per yard .....	60 lbs.
Steel—On road .....	115.55 mi.
Average weight per yard .....	60 lbs.
Ties—Average number per mile.....	2,760
Number laid during the year .....	72,800

Ballasted—On whole line .....	221.99 mi.
In Ohio.....	217.84 mi.
With gravel and stone.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 24; greatest age, 13 years; aggregate length, 3,472 feet.

Iron, 45;	"	13	"	"	2,697	"
Stone arch, 3;	"	...	"	"	280	"

Total ..... 6,449 feet.

Trestles—6; greatest age, 4 years; greatest height, 16 feet; greatest length, 106 feet; aggregate length, 376 feet.

Length of shortest span of truss, 36 ft. 7 in.; of longest, 152 ft. 2 in.; greatest length of beams between points of support, if not trussed, 60 feet.

Greatest space between cross ties upon bridges and trestles, 8 inches; length of ties, 8 ft. 6 in.

Number of track stringers on single track, 2.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent person? Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole line.	In Ohio.
Number miles fencing, computed as single line.....	334.31	328.16
Kind of fencing, as follows:		

Post and board (average cost per rod, \$1.03).

Wire (average cost per rod, \$ .66.)

Average cost of fencing, 84½ cents.

Average cost of same per rod, 84½ cents.

Length of road unfenced, and the reason therefor, 59.2 miles; part of this is in city limits; part requires no fencing.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Cincinnati and Eastern R. R. at Batavia Junction, O.

Marietta and Cincinnati R. R. at Loveland, O.

Springfield Southern R. R. at South Charleston, O.

Cincinnati and Springfield R. R. at London, and 3 miles west of Columbus, O.

Columbus and Hocking Valley R. R. at Columbus, O.

Toledo, Delphos and Burlington R. R. at Xenia, O.

Toledo, Delphos and Burlington R. R. at Stillwater Junction, O.

What railroads cross your road either over or under grade in this State, and where?

Toledo, Delphos and Burlington R. R. at Highlands, O.

Number of crossings of highways at grade in this State without protection, 222.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 24.

Number of crossings of highways over railroad, 12.

" " " under railroad, 13.

Highway bridges 18 feet above track, 9.

less than 18 feet above track, 3.

Do all trains stop at R. R. crossings as required by law? Yes.

Are flagmen stationed at each? No.

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated, 196.14; in Ohio, 191.95.

Miles of same owned by railroad company, and W. U. Tel. Co., 196.14; in Ohio, 191.95

### STATIONS.

Passenger and freight, 49; in Ohio, 47.

Number with telegraph communication, 24; in Ohio, 22.

Number of same operated by railroad company, 24; in Ohio, 22.

Is pay received for messages sent over line owned by railroad company? Yes, for commercial business.

## ROLLING STOCK.

Locomotives.....	45; average weight.....	58,700 pounds.
Express and baggage cars .....	9; " .....	31,100 "
Passenger cars.....	33; " .....	38,700 "
Freight cars .....	687; " .....	18,810 "
Other cars.....	20; " .....	22,350 "

Number of locomotives equipped with train brakes, 18.

Kind of brake: Westinghouse.

Number of cars equipped with train brakes, 48.

Kind: Westinghouse.

Method of bridging between passenger cars, when two or more are run in trains:

Janney platform and coupler.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Dripps & Winslow's patent stoves.

Means of lighting same: All cars are lighted with 300° fire test mineral sperm oil.

### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	30 miles per hour.
Mail and accommodation, " .....	20 "
Freight trains, " .....	12 "

## EMPLOYES.

Superintendents .....	1
Telegraph operators .....	42
Engineers .....	43
Baggagemen.....	27
Laborers.....	108
Clerks .....	30
Train dispatchers.....	3
Firemen .....	43
Wipers.....	13
Mechanics .....	83
Conductors .....	36
Brakemen .....	93
Station agents .....	47
Section men.....	268
Other employes.....	157
Total number employed by company in operating line.....	994
Proportion for Ohio.. .....	820

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American and Adams.

Terms: The American Express Company pays us, between Columbus and Cincinnati, \$50 per day; between Dayton and Richmond, \$4.773 per day; between Dayton and Xenia, 13½ cents per 100 lbs., and messenger fares \$1 per day; between Springfield and Xenia, 20 cents per 100 lbs. The Adams Express Company pays us, between Columbus and Cincinnati, 40 per cent. of gross receipts—excepting oyster business—and 70 per cent. of gross receipts from oyster traffic.

Special freight and transportation lines: The through freight cars of the Pennsylvania Route, now owned by the Pennsylvania Company, under the names of Union Line and National Line, carrying the through freight traffic at current rates, and are paid a commission for obtaining and doing the business.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives	Passenger .....	12	Frogs.....		8
	Freight.....	12	Ties—Oak .....		7
Cars .....	Passenger .....	12	Bridges.....	Wooden.....	12
	Baggage .....	12		Iron .....	12
	Box .....	14		Trestles .....	7
	Stock .....	10		Piling .....	7
	Coal .....	8	Telegraph poles—Cedar .....		8
	Flat.....	8	Fence posts.....		8
Rails—Iron .....		7			



## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles.....	04 Cts.	03 Cts.	} 2.215 Cts.
For distances over 8 miles—First class.....	03	02	
Second class.....	02	01	
Emigrant.....	02	01	
Excursion.....	02	01	
Account charged in addition to regular fares, in sleeping or other cars run on your road: For seat, 50 cents; berth \$2; section, \$4; state room, \$4. These vary according to distance.			

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

First class.....	.0088	.0025	} .0060
Second class.....	.0088	.0021	
Third class.....	.0075	.0018	
Fourth class.....	.0075	.0015	
Fifth class.....	.0063	.0013	
Special class.....	.0038	.0010	

Rate per ton per mile on freight carried less than 30 miles:

First class.....	.1760	.0600	} .01201
Second class.....	.1760	.0600	
Third class.....	.1500	.0600	
Fourth class.....	.1500	.0560	
Fifth class.....	.1260	.0560	
Special class.....	.0760	.0380	

Rate per ton per mile on freight carried more than 30 miles:

First class.....	.0520	.0500	} .01201
Second class.....	.0520	.0420	
Third class.....	.0460	.0360	
Fourth class.....	.0400	.0300	
Fifth class.....	.0400	.0260	
Special class.....	.0340	.0200	

Rate per ton per mile for—

Coal—Carried ten miles or more.....	.0500	.0158	.....
Carried less than ten miles.....	.0500	.0500	.....
Pig iron—Carried ten miles or more.....	.0500	.0220	.....
Carried less than ten miles.....	.0500	.0500	.....
Limestone—Carried ten miles or more.....	.0500	.0180	.....
Carried less than ten miles.....	.0500	.0500	.....
Iron ore—Carried ten miles or more.....	.0500	.0180	.....
Carried less than ten miles.....	.0500	.0500	.....
Undressed stone or lumber—			
Carried ten miles or more.....	.0500	.0180	.....
Carried less than ten miles.....	.0500	.0500	.....

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length—feet.
Wolf Creek, No. 74.....	Kellogg & M. Full Truss	Iron .....	154
Near Little Post, No. 93.....	Girder .....	" .....	46
Hawkers, " 65.....	Full Howe Truss .....	Wood.....	87
Near Mile Post, " 47.....	Girder .....	Iron .....	16
Spring St., Columbus, O., No. 56	" .....	" .....	155
1 mile east Loveland, No. 9....	" .....	" .....	27
$\frac{1}{4}$ " " Freeport, No. 19....	" .....	" .....	26 ft. 8 in.
West of Caesar Creek, No. 144	" .....	" .....	19
Near Mile Post 48, No. 23.....	" .....	" .....	19
" " 77, " 41.....	" .....	" .....	70
" " 87, " 43.....	" .....	" .....	49 ft. 8 in.
" " 89, " 44.....	" .....	" .....	22
" " 92, " 45.....	" .....	" .....	30

Fencing in Ohio—Miles of single fence built (average cost per rod, 84 $\frac{1}{2}$ c.) 8 miles.

Ballasting—Miles of main track ballasted with gravel, 30; in Ohio, 30.

Rail laid—Steel, 60 pounds per yard, miles of track, 20.5; in Ohio, 20.5.

Train mileage—Passenger ..... 602,951

Freight ..... 686,114

Work ..... 25,138

Total ..... 1,314,203

Car mileage—Passenger ..... 1,596,772

Express and baggage ..... 939,783

Freight—loaded ..... 7,225,578

empty ..... 1,816,971

Caboose ..... 359,496

Construction and other ..... 100,552

Total ..... 12,039,152

Fuel consumed—Wood, 1,405 $\frac{3}{4}$  cords; coal, 34,159 tons; total cost, \$80,270.14

Losses, etc., paid—On goods and baggage ..... \$2,956 15

For injuries in Ohio, fatal and non-fatal :

to passengers ..... \$1,822 00

to employes ..... 2,094 59

to others ..... 6,187 50

Total ..... \$10,104 09

For animals killed in Ohio :

Horses, 8 ..... \$457 88

Mules, 2 ..... 100 00

Cattle, 3. .... 52 00

Hogs, 1 ..... 1 05

Total ..... \$611 43

Amount claimed in litigation, etc., for injuries in Ohio to persons ..... \$5,000 00

Passengers—Number carried, local.....	811,041	
through .....	110,163	
Total.....		921,204
Average number carried in each car per trip .....		14.12
Average number of miles traveled by each .....		24.533
Total mileage, or number carried one mile .....		22,600,391
Average amount received for each.....		\$4.347c.
Average amount <i>per mile</i> received for each .....		2.215c.
Freight—Tons carried—local .....	448,439	
through .....	378,010	
Total.....		826,449
Average tons in each loaded car per trip.....		9.15
“       “                    “       mile .....		9.15
Total movement, or tons carried one mile .....		66,099,911
Average amount received for each ton .....		96.022c.
“       amount <i>per mile</i> received for each ton .....		1.201c.
“       cost per ton freight per mile.....		.930c.
“       amount received for each ton through freight.....		94.826c.
“       amount received for each ton local freight.....		97.031c.
“       cost each ton through freight, } .....		.930c.
“       “                    local                    “       }		
Articles transported :	Tons.	Per cent.
Coal.....	165,237	20.
Stone, lime, sand, etc.....	19,092	2.3
Petroleum .....	10,010	1.2
Ores.....	933	.1
Pig and bloom iron.....	11,832	1.4
Manufactured iron .....	34,813	4.2
Lumber and other forest products.....	107,963	13.1
Grain, flour, and other agricultural products .....	153,369	18.6
Live stock .....	63,738	7.7
Animal products .....	25,341	3.1
Manufactures, including agricultural implements .....	176,739	21.4
Merchandise .....	51,460	6.2
Miscellaneous.....	5,921	.7
Total tonnage yielding revenue .....	826,449	100.
Supplies for company's use .....	37,594	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local .....	\$255,553 99	
through .....	245,092 16	
Total .....		\$500,646 15
Freight transportation—local.....	\$435,125 14	
through.....	358,450 79	
Total .....		793,575 93
Mail service.....		52,728 69
Express service.....		44,045 14
Other sources.....		189,702 03
Total earnings of line operated included in this report.....		\$1,580,697 94

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$245,615 34	
Maintenance of cars .....	93,315 92	
Motive power.....	262,307 37	
Conducting transportation.....	377,512 07	
General expenses :		
Taxes in Ohio.....	\$51,128 23	
Indiana.....	393 18	
Salaries .....	9,307 61	
Other general expenses of operating .....	38,878 20	
	99,707 22	
Total operating expenses, being 68.23 per cent. of earnings .....		\$1,078,457 92
Net earnings of 196.14 miles operated.....		\$502,240 02
Rentals paid for use of road, track, depots, equipment, etc. :		
Rent of Little Miami R. R. <sup>a</sup> and leased line .....	\$682,618 04	
Interest on Cin. Street Connection R. R. bonds .....	20,062 50	
		702,680 54
Deficit to lessee .....		200,440 52
Per mile of earnings . ....	\$8,059 03; proportion for Ohio (191.95 mi.)	\$1,546,930 81
operating expenses.....	5,498 41;      "      "      "	1,055,419 80
net earnings .....	\$2,560 62;      "      "      "	\$491,511 01

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

Number.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880.				
1	July 6	Richard Welsh	Laborer	Walking on track; intoxicated.	Killed.
2	17	Annie Smith		Playing on cars	One arm cut off.
3	Aug. 8	J. A. Morr.	Brakeman	Coupling cars	Flesh wound; one of his fingers.
4	20	F. M. Baker	"	"	Left arm crushed.
5	20	Eddie Welch	School boy	Stealing ride; fell between cars.	One leg cut off.
6	23	Geo. Winnans	"	"	Killed.
7	Sept. 14	M. Traber	Watchman	Jumped from train while in motion.	Bruised about head and shoulders.
8	14	John Ready	Tinner	Fell off train while in motion.	Left arm cut off.
9	13	Wm. McGill	Apprentice	Jumped from train while in motion.	Left leg cut off.
10	30	Laura Atkins		Attempting to cross track in front of train.	Bruised about the head.
11	Oct. 1	Chas. Parchman	Brakeman	Coupling cars	Right hand mashed.
12	15	Eliza Ford	Laborer	Attempting to get on freight train.	Killed.
13	20	James Graham	Brakeman	Coupling cars	Bruised about chest and shoulders.
14	31	Geo. Hess	Laborer	Found on track	Killed.
15	Nov. 1	Wm. Gillen	Brakeman	Getting off train; struck water crane	Bruised about the head.
16	2	Thos. Leen	"	Coupling cars	Right hand mashed.
17	2	Wm. Collis	"	"	Left hand injured.
18	3	Jas. McCormick	"	Stepping from one cut of cars to another.	Killed.
19	14	Wm. Emery	"	Coupling cars	One hand mashed.
20	27	Wm. Foley	Tramp	Attempting to get on freight train.	Right arm cut off.
21	Dec. 2	Daniel Curran	Brakeman	Coupling cars	Left arm broken.
22	23	James Lynch	"	"	Right arm crushed.
	1881.				
23	Jan. 22	Arthur Stoddart	Brakeman	Coupling cars	Right arm crushed.
24	22	Edward Strickler	"	Attempting cut off cars; fell betw'n them.	Right leg cut off.
25	Feb. 2	James Tober	"	Coupling cars	Right hand mashed.
26	8	Joseph Deans	"	"	Right hand mashed.
27	15	Tim. Golden	"	"	Left leg bruised.
28	15	Wm. Bremen	Car repairer	Cars moved while he was at work.	Both legs bruised.
29	Mar. 22	Agil Sharpe	School girl	Playing on the street.	Bruised about the head.

30		Wm. Anos.....	Brakeman.....	Struck by stock chute.....	Injured about head and legs.
31	26	Mr. W. C. Dean.....	Farmer.....	Struck by passing train at public landing, Cincinnati.....	Injured about head.
32	26	Mrs. W. C. Dean.....	Farmer's wife.....	Struck by passing train at public landing, Cincinnati.....	Injured about head.
33	April 12	J. C. Crick.....	.....	Jumped from train while in motion.....	Killed.
34	13	S. P. Atwood.....	Agent.....	Coupling cars.....	One finger cut off.
35	20	G. McDurmott.....	Soldier.....	Fell off train; intoxicated.....	Bruised about head.
36	28	Frank Fair.....	Brakeman.....	Brake staff breaking.....	Not seriously hurt.
37	May 5	Peter Kahoe.....	Yardmaster.....	Fell from freight car.....	Side bruised.
38	6	Chas Stoddart.....	Brakeman.....	Uncoupling cars.....	One finger cut off.
39	June 16	Chas. Davis.....	".....	Foot caught in frog.....	Killed.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Run over in yards, on sidings, or in switching.....	1
Others—Getting on or off engine or train in motion.....	2
Run over in yards, on siding, or switching.....	2
Lying, walking, falling, or being on track .....	1
Catching foot in frog or between rails—run over .....	1
<hr/>	
Total .....	8

## PERSONS INJURED—CAUSES.

Passengers—Getting on or off engine or train in motion.....	1
Falling or thrown from engine or train .....	1
Employees—Struck by bridge, chute, or other obstruction .....	2
Coupling, or caught between cars and engine .....	16
Falling or thrown from engine or train .....	1
Run over while inspecting wheels.....	1
Breaking of brake rod, chain or wheel in setting.....	1
Others—Getting on or off engine or train in motion.....	1
Driving or riding across track .....	2
Falling or thrown from engine or train.....	1
Run over in yards, on siding or switching .....	5
<hr/>	
Total .....	32

## RECAPITULATION.

Killed—Employees—from misconduct or want of caution .....	2
Others—stealing rides.....	3
trespassing, on track, etc.....	2
<hr/>	
Total killed .....	7
Injured—Passengers—from misconduct or want of caution.....	1
Employees—from causes beyond their control .....	2
misconduct or want of caution .....	19
Others—at stations and highway crossings .....	3
stealing rides .....	4
trespassing on track, etc.....	3
<hr/>	
Total injured.....	32



## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of Accident.
	1880.				
1	Aug. 5	Spring Valley.....	Construction.....	Bad brake.....	Engine damaged.
2	14	Cincinnati.....	Passenger.....	Failure to obey rules.....	“ “
3	30	S. Charleston.....	Freight.....	Broken switch rod.....	Three cars off track.
4	Oct. 8	Batavia Junction.....	Passenger.....	Failure to obey rules.....	Two “ “
5	Nov. 11	Florence.....	Freight.....	Breaking in two.....	Killed 23 hogs.
6	Dec. 8	Old Town.....	Passenger.....	Engine off track.....	Baggage car damaged.
	1881.				
7	Jan. 19	Jacoby's.....	“.....	Broken rail.....	Train off track.
8	22	Dayton.....	Freight.....	Disregarding signals.....	Three cars off track.
9	29	Enon Crossing.....	Mixed.....	Broken rail.....	Train off track.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	6
Collisions—crossing.....	1
Rear.....	2
Total accidents.....	9

## Causes of accidents effecting derailment of trains:

Broken rail.....	2
Broken switch rod.....	1
Other causes.....	3
Total.....	6

## Causes of Collisions:

Failure of brakes.....	1
Orders—absence of, mistake in, neglect or disobedience to.....	2
Total.....	3

*State of Pennsylvania, County of Allegheny, ss :*

Thos. D. Messler, Third Vice President of the Pittsburgh, Cincinnati and St. Louis Railway Company, Lessee of the Little Miami Railroad, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

THOS. D. MESSLER,  
Third Vice President.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 10th day of September, A. D. 1881.

[SEAL]

FRANK SEMPLE,  
Notary Public.

## MAHONING COAL RAILROAD COMPANY.

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Name of road: The Mahoning Coal Railroad.

By whom owned: The Mahoning Coal Railroad Company.

By whom operated: The Lake Shore & Michigan Southern Railway Company.

By what authority: Lease.

Name of person making this report: L. C. Higgins, Secretary and Treasurer, Mahoning Coal Railroad Company.

General office at Cleveland, Ohio.

Principal office in Ohio at Cleveland, Ohio.

Address correspondence relating to this report to L. C. Higgins, Secretary and Treasurer, at Cleveland, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

February 25, 1871, the Mahoning Coal Railroad Company was incorporated under the law of Ohio of May 1, 1852, to construct a railroad from the city of Youngstown, Ohio, to the township of Brookfield, Trumbull county, Ohio.

December 9, 1871, an additional certificate was filed extending the road from Brookfield to Andover, Ashtabula county, Ohio, there to connect with the Ashtabula Branch of the L. S. & M. S. R'y.

August 14, 1872, a certificate was filed under the law of April 27, 1872, to construct two branches—one to extend from Youngstown to the village of Struthers, in Poland township, Mahoning county, Ohio, a distance of about three miles; the other to extend from Youngstown to the "Foster Farm" in Youngstown township, a distance of about three miles.

July 17, 1873, a certificate was filed to construct two branches—one known as the Vienna Branch, from the main line at Tyrrell Hill, in a south-westerly direction, to a point on the township line between Vienna & Liberty townships, Ohio, a distance of about six miles; the other known as the Hubbard Branch, from the main line at Coalburg, in the direction of Sharon, Pa., to the Pennsylvania and Ohio State Line, a distance of about seven miles.

The main line from Youngstown to Andover, thirty-eight miles, was opened for business August 1, 1873; 2 $\frac{1}{2}$  miles of the Vienna Branch, from Tyrrell Hill, was completed in November, 1873, thence extended 1 $\frac{4}{10}$  miles to the Holliday Coal Mine September, 1875.

One mile of the Hubbard Branch, from Coalburg to the Bennett Coal Company's mines, was completed in November, 1873.

May 1, 1873, the entire road was leased to the L. S. & M. S. R'y Co., for twenty-five years, at a rental of forty per cent. of the gross earnings.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Daniel P. Eells .....	President .....	Cleveland, O. ....	.....
L. C. Higgins.....	Secretary and Treasurer...	" .....	.....
Daniel P. Eells .....	} Executive Committee. {	" .....	.....
Amasa Stone .....		" .....	.....
H. B. Payne.....		" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Daniel P. Eells.....	Cleveland, O.....	W. C. Andrews.....	Willoughby, O....
Amasa Stone.....	" .....	C. H. Andrews.....	Youngstown, O..
H. B. Payne .....	" .....	L. C. Higgins .....	Cleveland, O....
Augustus Schell.....	New York, N. Y.		

## CAPITAL STOCK.

Capital stock authorized by law—Amount—common.....	\$1,500,000 00
Number of shares—common.....	30,000
Par value of each—common.....	\$50 00
Capital stock authorized by vote of company—common .....	1,500,000 00
Amount subscribed—common.....	1,373,000 00
Total paid in capital stock—common .....	1,373,000 00
Average amount paid in per mile of single main track ( $43\frac{4}{10}$ miles).....	31,635 94
Proportion of same for Ohio.....	All

Capital stock issued, and on what account, as follows:

For subscriptions paid in cash, number shares, 27,460; amount of common, \$1,373,000.

Stockholders, residents of Ohio, 10.

Amount of stock held by them June 30, 1881, \$645,700.

Agents authorized to transfer stock: Union Trust Co., New York, N. Y.

Number of shares transferred within the year at such agencies, 3,450.

## FUNDED DEBT.

Kind of bond or obligations, first mortgage; if and how secured, on railroad; date of issue, January 1, 1872; when due, January 1, 1902; rate of interest, 7 per cent.; amount of authorized issue, \$1,500,000; amount actually issued, \$1,486,000.

Average amount per mile of single main track ( $43.4$  miles)..... \$34,239 63

Proportion of same for Ohio, all.

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$2,230 05	
All other debts, current credit balances, etc.....	322,049 50	
Total unfunded debt.....	324,279 55	
Cash securities, debit balances, etc., available to payment	345 85	
Net unfunded debt.....		\$323,933 70
Average amount per mile of single main track.....	7,463 91	
Proportion of same for Ohio, all.		
Increase since June 30, 1880.....	15,919 95	
Total net debt liabilities .....		1,809,933 70
Average amount per mile of single main track .....	41,703 54	
Proportion of same for Ohio, all.		
Total of paid in stock and debt .....		3,182,933 70
Total-average amount per mile.....	73,339 48	
Proportion of same for Ohio, all.		

## COST OF ROAD EQUIPMENT, ETC.

Total expenditures for construction .....	\$2,766,116 49
Total expended for construction and purchase .....	2,766,116 49
Average cost per mile of road constructed (single main track, 43.4 mi.)	63,735 40
Average cost per mile of road owned by company, same.	
Proportion of same for Ohio, all.	

Equipment furnished by L. S. & M. S. R'y Company under lease. None owned by this company.

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Andover to Youngstown .....	38.31	38.31
Tyrrell Hill to Vienna .....	2.68	2.68
Vienna to Holliday Bank.....	1.42	1.42
Coalburg to New York, Ohio.....	0.99	0.99
Total single main track .....	43.40	43.40
Aggregate of sidings and other tracks .....	8.52	8.52
Total length laid with rail computed as single track .....	51.92	51.92
Laid with steel rail .....	9.96	9.96

Length in Ohio, distributed as follows:

County.	Main track.	Branches.	Sidings, etc.	Total.
Ashtabula .....	7.85	.....	1.64	9.49
Trumbull .....	27.56	5.09	3.85	36.50
Mahoning .....	2.90	.....	3.03	5.93
Total .....	38.31	5.09	8.52	51.92

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4 ft. 8½ in.
Grade—Maximum, per mile.....	40 feet.
Longest maximum.....	8,000 “
Aggregate length of maximum .....	8,000 “
Curvature—Shortest radius.....	521.67 “
Aggregate length of shortest radius.....	350 “
Aggregate length of all radii.....	6.77 miles.
Aggregate length of tangent .....	31.54 “
Rail—Iron—On road, includes sidings and branches .....	41.96 “
Average weight per yard.....	60 lbs.
Steel—On road, includes sidings.....	9.96 miles.
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	2,800
Number laid during the year .....	17,236
Ballasted—On whole line, all ballasted.	
With gravel and cinders.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 1; greatest age, 8 years; length .....	100 feet.
Iron, 1; greatest age, 8 months; length.....	32 feet.
Total .....	132 feet.
Trestles—3; greatest age, 8 years; greatest height, 31 feet; greatest length, 724; aggregate length, 1,216.	
Length of shortest span of truss, 90 ft.; of longest, 90 feet; greatest length of beams between points of support, if not trussed, 12 feet.	
Greatest space between cross ties upon bridges and trestles, 6 inches; length of ties, 8 to 12 feet.	
Number of track stringers, 4.	
Are all bridges and trestles provided with guard rails? Yes.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Monthly.	
Are the examinations analytical, and are they made by a competent person? Yes.	

Fencing—Average and aggregate cost.	Whole line.	In Ohio.
Number miles fencing, computed as single line.....	76	76
Kind of fencing, as follows:		
Post and board, (average cost per rod, \$1.00).....	73.87	73.87
Wire (average cost per rod, 75 cents).....	2.13	2.13
Length of road unfenced, and the reason therefor: At bridges, stations, etc.....	0.31	0.31

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

N. Y., P. and Ohio R. R. at Youngstown and Latimer.

Number of crossings of highways at grade in this State without protection, 41.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 3.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated ..... 38; in Ohio, all.

## STATIONS.

Passenger and freight, in Ohio ..... 6

Number with telegraph communication, in Ohio ..... 6

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

## EQUIPMENT AND SUPERSTRUCTURE.

Ties—Oak—Average life in years..... 9

Bridges—Wooden, if properly covered—Average life in years..... 25

Trestles, about—Average life in years ..... 9

Piling, about—Average life in years..... 12

Fence posts—Average life in years ..... 9

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Location, Little Yankee Creek; construction, plate girder; material, iron; length, 32 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, 65c.), 2.63.

Ballasting—Miles of main track ballasted, 9.21; in Ohio, 9.21.

Rail laid—Steel, 60 lbs. per yard—miles of track, 9.56; in Ohio, 9.56.

All renewals by L. S. & M. S. R'y under lease. No expenditure by Mahoning Coal R. R. Co.

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt—.....	\$13,374 00	
Rental of road.....	88,715 98	
Interest on deposits.....	421 94	
Settlement of old construction account.....	313 29	
	<hr/>	\$102,825 21

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$104,020 00	
General office expense.....	1,351 16	
	<hr/>	\$105,371 16

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$1,373,000 00	
First mortgage bonds .....	1,486,000 00	
Floating debt.....	324,279 55	
	<hr/>	\$3,183,279 55

## ASSETS.

Railroad .....	\$2,766,116 49	
Cash .....	345 85	
Profit and loss—to balance .....	416,817 21	
	<hr/>	\$3,183,279 55

*State of Ohio, County of Cuyahoga, ss.:*

L. C. Higgins, Sec'y and Treas. of the Mahoning Coal Railroad Co. accounts, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

L. C. HIGGINS,

*Sec'y and Treas. M. C. R. R.*

Subscribed and sworn to before me, this 24th day of August, A. D. 1881.

[SEAL.]

NICHOLAS BARTLETT,

*Notary Public.*



## RECEIVER MARIETTA AND CINCINNATI RAILROAD.

Name of road: Marietta and Cincinnati Railroad.

By whom owned: Marietta and Cincinnati Railroad Company, as reorganized.

By whom operated: John King, Jr., and Receiver.

By what authority: Order of Ross County Court of Common Pleas.

Name of person making this report: John King, Jr., Receiver.

General office at Cincinnati, Ohio.

Principal office in Ohio at Cincinnati, Ohio.

Address correspondence relating to this report to Charles F. Low, Auditor, at Cincinnati, O.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
John Waddle.....	President M. & C. R. R.....	Cincinnati, Ohio.....	
John King, Jr.....	Receiver.....	" " .....	\$5,000
Chas. F. Low..	Secretary M. & C. R. R.....	" " .....	
Chas. F. Low.....	Auditor for Receiver.....	" " .....	2,500
Wm. E. Jones.....	Cashier for Receiver.....	" " .....	1,800
Jas. H. Stewart.....	Gen'l Supt. for Receiver...	" " .....	5,000
John Waddle.....	Chief Eng'r for Receiver...	" " .....	2,500
Thos. P. Barry.....	Gen'l Pass. Agt. for Recv'r	" " .....	2,500
R. M. Fraser.....	Gen'l Frt. Agt. for Recv'r	" " .....	3,600
Total salaries.....			22,900

### DIRECTORS.

Name.	Residence.	Name.	Residence.
John Waddle.....	Chillicothe, O...	George Hoadley.....	Cincinnati, O.
Robert Garrett .....	Baltimore, Md...	W. T. McClintick.....	Chillicothe, O.
Henry C. Smith.....	"	Wm. Waddle.....	"
Wm. F. Burns.....	"	W. B. Loomis.....	Marietta, O.
W. W. Scarborough.....	Cincinnati, O.....	Theo. Cook.....	Cincinnati, O.
Jas. D. Lehmer.....	" .....	W. W. Peabody.....	"
R. M. Bishop.....	"		

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, C. & B. Junction to Main Line Junction.....	156.80	All.
Main Line Junction to Scott's Landing.....	31.20	"
Belpre to Marietta.....	11.10	"
Portsmouth to Hamden.....	55.40	"
Blanchester to Hillsboro.....	21.40	"
Total single main track.....	275.90	
Double track, C. & B. Junction to Norwood.....	3.40	
Aggregate of sidings and other tracks.....	48.30	
Total length laid with rail computed as single track.....	327.60	
Laid with steel rail.....	141.70	

Length in Ohio, distributed as follows:

County.	Main track.	Branches.	Double track.	Sidings, etc.	Total.
Hamilton .....	17.70	.....	3.40	3.30	24.40
Clermont.....	5.00	.....		.80	5.80
Warren.....	9.70	.....		1.70	11.40
Clinton.....	17.80	11.10	.....	4.20	33.10
Highland .....	17.70	10.30	.....	3.30	31.30
Ross .....	38.10	.....		11.40	49.50
Jackson.....	8.90	29.50	.....	6.30	44.70
Vinton.....	25.60	90	.....	5.90	32.40
Lawrence.....	.....	1.60	.....	.10	1.70
Scioto .....	.....	23.40	.....	2.00	25.40
Athens.....	16.30	10.30	.....	8.70	35.30
Washington .....	.....	32.	.....	.60	32.60
Totals.....	156.80	119.10	3.40	48.30	327.60
Steel rail.....	141.70	.....	3.40	.....	.....

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Cincinnati and Baltimore.....	5.8	All.
Baltimore Short Line .....	30.3	"
Total single track.....	36.1	All.
Double track.....	5.8	"
Sidings and other tracks, 8.8, 6.7.....	15.3	"
Total .....	57.2	All.

## GAUGE, GRADE, RAILS, ETC.

Gauge.....	4.7 feet.
Grade—Maximum, per mile.....	52.8 "
Longest maximum.....	186 "
Curvature—Shortest radius.....	637 "
Aggregate length of shortest radius.....	800 "
Rail—Iron—Average weight per yard.....	62 lbs.
Steel—On road.....	141.7 miles.
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	2,640
Number laid during the year .....	166,600
Ballasted—On whole line.....	All.
In Ohio.....	All.
With gravel, stone and cinders.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	114; greatest age... 19 years; aggregate length...	6,721 ft.
Iron.....	11; " ... 11 years; " ...	1,685 "
Stone arch, 22; .....	" ...	440 "
Total.....		8,846 ft.
Trestles—263; greatest age, 14 years; greatest height, 90 ft.; aggregate length, 31,705 feet.		
Length of shortest span of truss, 25 feet; of longest, 35; greatest length of beams between points of support, if not trussed, 12 ft.		
Greatest space between cross ties upon bridges and trestles, 8 inches; length of ties, 9 feet.		
Number of track stringers, 2 and 4.		
Are all bridges and trestles provided with guard rails? Yes.		
Do all bridges and trestles receive stated examinations? Yes.		
How often? Monthly.		
Are the examinations analytical, and are they made by a competent person? Yes.		

Tunnels—Stone.....	6; aggregate length.....	3,705½ feet.
Wood .....	2; " " .....	1,209 "
Total .....		4,914½ ft.

## FENCING—AVERAGE AND AGGREGATE COST.

	Length.	In Ohio.
Number miles fencing, computed as single line.....	348.18	All.
Average cost of same per yard.....	191.4	

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Cincinnati, Hamilton and Dayton Railroad at Cincinnati.

Cincinnati Northern Railway at Norwood.

Toledo, Delphos and Burlington Railway at Musselman's.

Scioto Valley Railway at Chillicothe.

Ohio and West Virginia Railroad at McArthur.

What railroads cross your road either over or under your grade in this State, and where?

Ohio Southern Railway, at Greenfield.

Number of crossings of highways at grade in this State without protection, unknown.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 10.

Number of crossings of highways over railroad, 18.

" " " under railroad, 26.

Number of highway bridges 18 feet above track, 18.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated—all in Ohio .....	825
Miles of same owned by railroad company—all in Ohio .....	607

### STATIONS.

Passenger and freight .....	84; in Ohio, All.
Number with telegraph communication .....	46; " "
Number of same operated by railroad company.....	46; " "
Is pay received for messages sent over line owned by railroad company? Yes.	

## ROLLING STOCK.

Locomotives.....	63; Average weight, lbs .....	100,000
Express and baggage cars.....	14; " " .....	31,500
Passenger cars.....	35; " " .....	35,700
Freight cars.....	1,205; " " .....	18,000

Number of locomotives equipped with train brakes, 19.

Kind of brake: Loughridge Air brake.

Number of cars equipped with train brakes, 49.

Kind: Loughridge Air brake.

Method of bridging between passenger cars, when two or more are run in trains:  
Wooden bridge.

State methods of heating cars used for the transportation of passengers: Wood stoves and Baker heaters.

Means of lighting same: Candles.

### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	30 miles per hour.
Mail and accommodation, .....	24 "
Freight trains, .....	13 "

## EMPLOYES.

Superintendents .....	1
Telegraph operators .....	65
Engineers .....	67
Baggagemen .....	21
Flagmen, switch-tenders and watchmen.....	72
Laborers .....	130
Clerks .....	89
Train dispatchers .....	8
Firemen .....	68
Wipers .....	26
Mechanics .....	348
Conductors .....	75
Brakemen.. .....	146
Station agents .....	78
Section men .....	514
Other employes .....	147

Total number employed by Company in operating line..... 1,855

Proportion for Ohio..... All.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives .....	{ Passenger .....	15	Rails—Iron.....		5
	{ Freight .....	15	Frogs .....		5
Cars .....	{ Passenger .....	10	Ties—Oak .....		5
	{ Baggage .....	10	Bridges .....	{ Wooden .....	15
	{ Box .....	10		{ Trestles .....	8
	{ Stock .....	10		{ Piling .....	
	{ Coal .....	10	Telegraph poles....	{ Cedar.....	18
	{ Flat .....	10		{ Other .....	15
			Fence posts.....		8

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.
Fare charged per mile—		
For distances less than 8 miles.....	3 Cts.	3 Cts.
For distances over 8 miles—First class .....	3	3
Second class.....	2	2
Emigrant .....	1½	1½
Excursion.....	1½	1½

Amount charged, in addition to regular fares, in sleeping or other cars run on your road: For seat, \$1.00; berth, \$2.00; section, \$4.00; state room, \$4.00.

## FREIGHT.

Rate per 100 lbs. per mile when freight weighs less than a ton :

First, second, third, fourth, fifth and special class, no separate tariff.

Rate per ton per mile on freight carried less than 30 miles :

First class .....	20 Cts.	9.33 Cts.
Second class.....	16	8.
Third class .....	14	7.33
Fourth class.....	12	6.66
Fifth class.....	10	6.
Special class .....	7	3.33

Rate per ton per mile on freight carried more than 30 miles :

First class .....	9.67 Cts.	3.90 Cts.
Second class .....	8.38	3.41
Third class .....	7.74	2.97
Fourth class.....	7.09	2.43
Fifth class .....	6.45	1.70
Special class .....	3.87	1.12

Rate per ton per mile for—

Coal—Carried ten miles or more .....	1.27 Cts.	0.75 Cts.
Carried less than ten miles .....	16.66	5.55
Pig iron—Carried ten miles or more .....	5.	0.72
Carried less than ten miles .....	14.69	4.89
Limestone—Carried ten miles or more.....	5.	1.12
Carried less than ten miles.....	16.66	5.55
Iron ore—Carried ten miles or more .....	5.	1.12
Carried less than ten miles.....	16.66	5.55
Undressed stone or lumber—Carried ten miles or more..	5.35	0.97
Carried less than ten miles	23.33	7.77

Rate per 100 pounds for loading :

First, second, third and fourth class, no separate charge ; fifth and special class, shippers to load.

Rate per 100 pounds for unloading :

First, second, third and fourth class, no separate charge ; fifth and special class, consignee to unload.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length—feet.
Miami Canal.....	Howe truss .....	Wood .....	90
O'Bannon Creek .....	" .....	" .....	86½
Middle Fork Salt Creek .....	" .....	" .....	110
Middle Fork Salt Creek. ....	" .....	" .....	110

Rail laid—Steel, 60 lbs. per yard—miles of track.....	52.7; in Ohio, All
Train mileage—Passenger .....	795,200
Freight .....	1,592,900
Mixed .....	314,400
Construction .....	51,000
Total.....	2,753,500
Car mileage—Passenger .....	1,962,442
Express and baggage .....	865,400
Freight—loaded.....	14,562,751
empty.....	5,092,565
Total.....	22,483,158
Fuel consumed—Wood, 932 cords; coal, 84,808 tons; total cost.....	\$136,951 00
Losses, etc., paid—On goods and baggage.....	13,540 39
For injuries in Ohio, fatal and non-fatal:	
to passengers.....	\$800 00
to employes.....	5,234 35
to others.....	784 85
Total.....	\$6,819 30
For animals killed in Ohio:	
Horses, 18.....	\$796 34
Mule, 1.....	37 50
Cattle, 50.....	789 41
Sheep, 13.....	30 00
Hogs, 36.....	115 00
Total.....	1,768 25

## TRANSPORTATION.

Passengers—Number carried, local .....	695,731	
through .....	47,519	
Total.....		743,250
Freight—Tons carried, local .....	600,595	
through .....	531,552	
Total.....		1,132,147
Articles transported—	Tons.	Per cent.
Coal.....	119,234	10.53
Stone, lime, sand, etc.....	7,172	0.63
Petroleum.....	14,412	1.27
Ores.....	40,680	3.59
Pig and bloom iron.....	62,877	5.55

## MARIETTA AND CINCINNATI RAILROAD.

1085

Manufactured iron.....	11,845	1.04
Lumber and other forest products .....	20,429	1.80
Grain, flour, and other agricultural products.....	530,317	46.86
Live stock.....	48,969	4.33
Animal products .....	20,776	1.83
Manufactures, including agricultural implements .....	26,045	2.30
Merchandise.....	92,075	8.14
Miscellaneous.....	137,316	12.13
Total tonnage yielding revenue.....	1,132,147	100

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30

## EARNINGS.

Passenger transportation—local.....	\$307,331	25
through.....	152,390	68
Total.....		\$459,721 93
Freight transportation—local .....	\$733,821	27
through.....	775,128	01
Total .....		\$1,508,949 28
Mail service.....		62,391 82
Express service.....		76,293 28
Other sources.....		13,047 93
Total earnings of line operated included in this report.....		\$2,120,404 24

OPERATING EXPENSES.

Maintenance of way and structures.....	\$686,592	18
Maintenance of cars.....	134,063	59
Motive power .....	409,589	03
Conducting transportation.....	500,765	52
“ telegraph.....	37,202	07
General expenses:		
Taxes in Ohio .....	\$58,711	26
Salaries.....	44,899	91
Other general expenses of operating.....	46,109	81
	—————	\$149,720 98
Total operating expenses, being 90.4 per cent of earnings.....	\$1,917,933	37
Net earnings of 280.08 miles operated .....	202,470	87
Rentals paid for use of road, track, depots, equipment, etc.		
Cincinnati and Baltimore Railway.....	\$101,633	53
Baltimore Short Line Railway.....	152,476	00



Portsmouth Branch.....	21,000 00	
O. C. & L. track.....	5,000 00	
Real estate, depot, etc.....	11,110 38	
		<hr/>
		\$291,219 91
Deficit .....		<hr/>
		\$88,749 04
Per mile of earnings.....	\$7,551 29; Proport'n for O. (280.8 miles)	All.
operating expenses..	6,830 24; " " "	
net earnings.....	721 05; " " "	
deficit.....	316 05; " " "	

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Pay-roll, month of June.....	\$75,427 99	
Acceptances—account of supplies.....	123,514 96	
Accounts payable for material and supplies.....	174,323 84	
Balance due account stock-yards Conner track.....	11,222 92	
“ “ “ rentals leased lines.....	76,723 00	
“ “ other railroads.....	} 221,285 29	
traffic accounts.....		
		<hr/>
		\$682,498 00

## ASSETS.

Advanced to creditors M. & C. Railroad.....	\$111,702 33	
“ “ first mortgage bondholders M. & C. Railroad...	123,119 50	
Uncollected revenue.....	31,944 27	
Cash in banks.....	22,412 44	
Material and supplies on hand.....	92,000 64	
Due from U. S. P. O. Department.....	16,302 85	
“ railroads, traffic accounts.....	46,178 11	
“ miscellaneous accounts.....	19,658 45	
Improvements and betterments.....	92,035 34	
Profit and loss, to date.....	127,144 07	
		<hr/>
		\$682,498 00

ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

MARIETTA AND CINCINNATI RAILROAD.

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Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1880.				
July 13	Unknown.....	Tramp.....	Asleep on bridge stringer.....	Slightly injured.
17	Mrs. Stickney & 2 men.....	Circus performers.....	Second section backing into first section.....	"
25	A. C. Shelton.....	Brakeman.....	Struck by overhead bridge.....	"
Aug. 14	Patrick Hickey.....	Section man.....	Lying on track intoxicated.....	Killed.
16	Oscar Reich.....	Unknown.....	"	"
19	L. Nicholas.....	Brakeman.....	Caught between car and water-tank.....	Slightly injured.
30	Chas. McAdow.....	"	Trestle giving way.....	"
Sept. 30	— Carnes.....	Unknown.....	Driving across track in front of engine.....	Badly injured.
13	Sylvester Wilson.....	Brakeman.....	Fell between cars.....	Killed.
23	Joseph Settle.....	Unknown.....	Driving across track.....	Slightly injured.
Oct. 12	John Walls.....	"	Fell between cars.....	"
14	Thos. Byers.....	Brakeman.....	Coupling cars.....	"
16	William Minor.....	Unknown.....	Walking on track (dead and dumb).....	Killed.
20	E. S. Boche.....	Conductor.....	Loose rail turning over.....	Slightly injured.
23	John Camp.....	Brakeman.....	Fell from train.....	"
27	Wm. Anderson.....	Unknown.....	Walking on track; intoxicated.....	"
Nov. 1	Frank McWilliams.....	Brakeman.....	Staking out cars.....	"
4	T. Lawhead.....	Engineer.....	Collision.....	Killed.
4	— Cryder.....	Fireman.....	"	Slightly injured.
4	N. F. Cilley.....	Conductor.....	"	"
4	— Blacenship.....	Brakeman.....	"	"
4	Chas. Creek.....	Fireman.....	"	"
4	G. W. Walters.....	Engineer.....	"	"
8	— Smiley.....	Unknown.....	Asleep on track.....	Slightly injured.
22	Chas. Grice.....	Conductor.....	Broken rail.....	Killed.
23	Thos. Stephens.....	Brakeman.....	Coupling cars.....	Slightly injured.
Dec. 26	Hiney Retzer.....	"	"	"
6	J. L. Hale.....	"	"	"
8	F. McWilliams.....	"	Broken rail.....	"
8	W. A. Perdew.....	"	"	"
24	E. McArty.....	Conductor.....	Fell from train while setting brake.....	"
1881.				
Jan. 3	E. L. Fletcher.....	"	Coupling cars.....	Killed.
5	— Hale.....	"	Struck by overhead bridge.....	Slightly injured.
				Badly

## ACCIDENTS IN OHIO—Continued.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1881.				
Jan.	9 Wm. Shaffer .....	Brakeman .....	Coupling cars .....	Slightly injured.
	12 W. McDaniels .....	" .....	Struck by overhead bridge .....	Badly
	15 John Nilon .....	" .....	Coupling cars .....	Slightly
	21 Wm. Daley .....	" .....	" .....	"
	23 E. Routt .....	Switchman .....	Foot fastened in frog .....	"
	26 Joseph Morton .....	Conductor .....	Coupling cars .....	Killed.
	28 Jas. Ogilbee .....	Switchman .....	Foot fastened in guard-rail .....	Slightly injured.
	30 R. Miller .....	Brakeman .....	Coupling cars .....	Leg broken.
Feb'y	5 S. Storge .....	Passenger .....	Broken rail .....	Slightly injured.
	5 C. Kelley .....	Brakeman .....	" .....	"
	9 Wm. Anthoff .....	" .....	Coupling cars .....	"
	15 William Doley .....	" .....	Thrown from top of car .....	"
March	21 Charles Cox .....	Passenger .....	Coupling cars .....	Killed.
	1 Thos. Edwards .....	Switchman .....	Jumped off train in front of approaching train .....	"
	7 Jas. Murphy .....	Conductor .....	Switching .....	Slightly injured.
	7 U. Campbell .....	Conductor .....	Setting brake .....	"
	7 A. Maxon .....	Brakeman .....	Coupling cars .....	"
	20 — Heery .....	" .....	" .....	"
	26 Chas. Parker .....	" .....	Fell off train while coupling cars .....	Killed.
	27 W. E. Gilchrist .....	" .....	Jumped from train in front of another .....	"
April	4 Geo. S. Blaney .....	Passenger .....	Run over by cars .....	Seriously injured.
	8 John McClain .....	Brakeman .....	Fell from train .....	Both jaws broken.
	14 A. Johnson .....	" .....	Jumped in front of train .....	Slightly injured.
May	29 Miss Eliza Mitchell .....	Brakeman .....	Jumped from train .....	"
	10 Samuel Dixon .....	Engineer .....	Caught between cars and engine .....	Seriously injured.
	12 — Michaels .....	" .....	Horse threw train from track .....	Killed.
	26 Geo. Reppert .....	Fireman .....	" .....	Slightly injured.
	26 James Reppert .....	Brakeman .....	Foot caught between rail .....	Seriously injured.
	26 Wm. Quinlin .....	Unknown .....	Run over by cars .....	Killed.
June	30 John McFaren .....	" .....	Struck by overhead bridge .....	Slightly injured.
	3 Martin Burke .....	Brakeman .....	Coupling cars .....	"
	15 Homer Betzer .....	" .....	" .....	"
	30 Jos. Camp .....	" .....	" .....	"

## SUMMARY OF ACCIDENTS.

Persons killed—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....	2			2
Run over in yards, on sidings, or in switching .....		1	1	2
Falling or thrown from engine or train.....		3		3
Collisions, and standing on platform of car during same...		2		2
Lying, walking, falling, or being on track.....		1	4	5
On hand cars, falling from or struck by engine .....		1		1
Miscellaneous .....				
Totals.....	2	8	5	15

Persons injured—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....		1		1
Driving or riding across track .....			2	2
Struck by bridge, chute, or other obstruction.....		4		4
Coupling, or caught between cars and engine.....		19		19
Falling or thrown from engine or train.. .....		5		5
Falling between cars.....			1	1
Lying, walking, falling, or being on track.....			2	2
Collisions.....	3	4		7
Run over in yards, on siding or switching.....		1		1
Run over, catching foot in frog or between rails.....		1	1	2
Engine or train leaving or thrown from track.....	1	7		8
Run over while inspecting wheels .....	1			1
Totals.....	5	42	6	53

## RECAPITULATION.

Killed—Passengers—from misconduct or want of caution.....	2
Employees—from causes beyond their control.....	8
Others—trespassing, on track, etc. ....	5
Total killed .....	15
Injured—Passengers—from causes beyond their control.....	4
misconduct or want of caution.....	1
Employees—from causes beyond their control.....	12
misconduct or want of caution.....	29
Others—trespassing on track, etc. ....	7
Total injured.....	53

## TRAIN ACCIDENTS—ENTIRE LINE.

*Return of accidents to trains occurring within the year ending June 30, 1881.*

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
July 5	Cincinnati yard.	Switching.	Absence of signals.	Engine and one car damaged.
16	East Monroe.	Ex. freight	Broken axle.	No other damage.
17	Chillicothe.	Freight	Rear collision—running carelessly.	Engine and 7 cars damaged; 3 persons slightly injured.
17	Stock yards.	"	Crossing collision—running carelessly.	Pilots broken and one freight car damaged.
19	Baker's Junction	"	Open switch.	Engine and nine cars damaged.
22	Main Line Junc.	"	Broken rail.	Nine cars badly damaged.
25	Coolville.	"	Rear collision—signal not seen.	Three cars destroyed; engine and seven cars damaged.
25	Loveland.	Ex. freight	Mistake in orders—rear collision.	Engine and 9 cars slightly damaged.
Aug. 8	Clinton Valley.	"	Train breaking in two.	Engine and 5 cars slightly damaged.
9	Blanchester.	Freight	Rear collision—signal not seen.	Engine and ten cars slightly damaged.
12	Monroe.	"	Absence of signals—rear collision.	Engine and two cars damaged.
20	Roxabell.	"	Trestle giving away.	Engine and 19 cars badly damaged; brakeman slightly injured.
Sept. 11	Chillicothe.	"	Rear collision—fog.	Engine and 4 cars slightly damaged.
13	"	Stock train	Misplaced frog.	One car damaged.
15	Schooley's.	Ex. freight	Fog and absence of signals—rear collision.	Engine and 5 cars slightly damaged.
Oct. 4	Hope Furnace.	"	Broken rail.	Three cars thrown from track and wrecked.
6	Symme's.	Freight	Broken axle.	Six cars slightly damaged.
9	C. H. & D. crossing	Switch eng.	Absence of signals—backing into crossing.	Engine and 5 cars slightly damaged.
11	Cincinnati yard.	Switching.	Train breaking in two—cause miscoupled.	Five cars slightly damaged.
17	Lexington.	Freight	Misplaced switch.	Two cars slightly damaged.
20	"	"	Loose rail.	Two cars damaged; conductor slightly injured.
21	Vinton.	"	Track spreading.	Engine and 5 cars slightly damaged.
21	Cincinnati yard.	Switching.	Rear collision—C. C. C. & I. train.	One car slightly damaged.
29	"	"	Crossing collision—P. C. & St. L. train.	Engine and 2 cars slightly damaged.
Nov. 4	Ingham's.	Ex. freight	Collision—mistake in orders.	Both engines and 13 cars badly damaged; 2 killed and 4 slightly injured.
9	Little Hocking.	Freight	Train breaking in two and coming together.	Two cars wrecked and four damaged.
11	Guysville.	"	Broken axle.	Two cars slightly damaged.
22	Farmer's.	"	Broken rail.	Caboose wrecked and one car damaged; conductor slightly injured.
Nov. 23	Guysville.	"	Broken rail.	Four cars destroyed and six badly damaged.
Dec. 2	Leesburg.	"	Absence of orders—rear collision—fog.	Engine and 8 cars slightly damaged.
8	Athens.	"	Rear collision—snow—absence of signal.	Engine and 4 cars slightly damaged.
8	Stewart's.	"	Broken rail.	Five cars slightly damaged; conductor and brakeman slightly injured.
30	Martinsville.	"	Misplaced switch.	Engine and 1 car slightly damaged.
Jan. 10	Cumminsville.	"	Collision—absence of signals.	Both engines slightly damaged.
29	Richland furnace	"	Train breaking in two and running together.	Six cars slightly damaged.
30	Brighton.	Switching.	Crossing collision.	Seven cars slightly damaged.
31	Blanchester.	Freight	2d section breaking in two and running into 3d sec.	Three cars slightly damaged.
Feb. 4	Chillicothe.	Stock train	Broken journal.	Three cars slightly damaged.
15	Gravel bank.	Passenger.	Broken rail.	Three cars thrown from track, slightly damaged; one passenger, leg broken; brakeman slightly injured.
15	Brighton.	Freight	No. 26 ran into yard eng.	Both slightly damaged.
18	Leesburg.	"	Track spreading.	Three cars slightly damaged.
19	Vienna.	"	Down grade—frosty track—rear collision.	Two cars destroyed; one damaged.

## TRAIN ACCIDENTS—ENTIRE LINE—Continued.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
Feb. 23	Stock yards.....	Switching..	Absence of signals—crossing collision.....	Two cars badly damaged.
Mar. 2	" .....	Freights...	Absence of signals—rear collision.....	Two cars badly damaged; engines 73 and 90, slightly.
17	Anderson's .....	Freight .....	Collision—absence of signals.....	Engines 67 and 82, and three cars slightly damaged.
May 26	Blanchester .....	" .....	Run over horse—threw train from track. ....	Engine and 5 cars badly damaged; fireman killed; engineer and brakeman slightly injured.
28	Chillicothe.....	" .....	Absence of orders—collision.....	Engines and three cars slightly damaged.
June 9	Athens .....	" .....	Rock and dirt in cut .....	Engine badly damaged; 3 cars slightly damaged.

State of Ohio, County of Hamilton, ss.:

John King, Jr., Receiver of the Marietta and Cincinnati Railroad Company, as reorganized, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

JOHN KING, JR.

Receiver.

Subscribed and sworn to before me this 5th day of September, A. D. 1881.

[SEAL.]

WILLIS H. WIGGINS,

Notary Public of Hamilton County, Ohio.

## MASSILLON AND CLEVELAND RAILROAD COMPANY.

Name of road: Massillon and Cleveland Railroad.

By whom owned: Massillon and Cleveland Railroad Company.

By whom operated: Pennsylvania Railroad Company.

By what authority: Lease.

Name of person making this report: F. M. Hutchinson, Secretary and Treasurer  
Massillon and Cleveland Railroad Company.

General office at Pittsburgh, Pa.

Principal office in Ohio at Massillon.

Address correspondence relating to this report to F. M. Hutchinson, Secretary  
at Pittsburgh, Pa.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Thos. D. Messler .....	President .....	Pittsburgh, Pa .....	.....
F. M. Hutchinson .....	Secretary and Treasurer ..	" .....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Thomas D. Messler .....	Pittsburgh, Pa.	M. A. Hanna .....	.....
George W. Cass .....	"	J. Irving Brooks .....	Salem, O.
J. N. McCullough .....	"	Lucien L. Gilbert .....	"
Wm. Stewart .....	"		

### CAPITAL STOCK.

#### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$200,000 00
Number of shares—common .....	4,000
Par value of each—common .....	\$50 00
Increase since June 30, 1880—common .....	250 00
Amount subscribed—common .....	196,450 00
Total paid in capital stock—common .....	196,450 00
Increase since June 30, 1880—common .....	250 00
Average amount paid in per mile of single main track (12.23 miles).	

Proportion of same for Ohio—All.

Capital stock issued—Number shares, 3,929.

Amount of common, \$196,450.00.

Stockholders, residents of Ohio, 18.

Amount of stock held by them June 30, 1881, \$66,400.00.

Agents authorized to transfer stock: F. M. Hutchinson, Secretary and Treasurer,  
196 Smithfield Street, Pittsburgh, Pa.

Number of shares transferred within the year at such agencies: 853.

#### FUNDED DEBT.

Kind of bond or obligations, first mortgage; date of issue, January 1, 1870; when due, January 1, 1890; rate of interest, 7 per cent.; amount of authorized issue, \$100,000; amount actually issued, \$100,000.

Average amount per mile of single main track (12.23 miles).....	\$8,176 61
Proportion of same for Ohio (12.23 miles).....	100,000 00
Amount in hands of trustees of sinking fund for redemption.....	14,957 82

#### OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$3,797 50	
Total unfunded debt.....	3,797 50	
Cash securities, debit balances, etc., available to payment...	22,881 11	
Net surplus .....		\$19,083 61
Total of paid in stock and debt.....		296,450 00
Total average amount per mile.....	\$24,239 57	
Proportion of same for Ohio: All.		

#### COST OF ROAD EQUIPMENT, Etc.

##### CONSTRUCTION ACCOUNT.

Total expenditures for construction to July 1, 1881.....	\$326,914 21	
Total expended for construction.....		\$326,914 21
Average cost per mile of road constructed (single main track 12.23 mi.)		26,730 52
Average cost per mile of road owned by company (single main track, 12.23 miles).....		26,730 52
Proportion of same for Ohio (12.23 miles).....		326,914 21

#### CHARACTERISTICS, Etc.

##### LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Massillon to Clinton.....	12.23	12.23
Total single main track.....	12.23	12.23
Aggregate of sidings and other tracks .....	2.07	2.07
Total length laid with rail computed as single track.....	14.30	14.30



Length in Ohio, distributed as follows :

County.	Main track.	Sidings, etc.	Total.
Stark.....	11.24	1.62	12.86
Summit .....	.99	.45	1.44
Totals.....	12.23	2.07	14.30

### OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

#### RECEIPTS OTHER THAN EARNINGS.

Rent of railroad .....	\$20,000 00	
Income on investment.....	917 08	
		\$20,917 08

#### PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$7,000 00	
Dividends, rate 5 per cent on general stock.....	9,782 50	
Last dividend declared on general stock, May 1, 1881.		
Applied to purchase of stocks and bonds.....	3,375 00	
General expenses .....	698 33	
		\$20,855 83

### CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

#### LIABILITIES.

Capital stock .....	\$196,488 20	
Mortgage bonds .....	100,000 00	
Coupons outstanding.....	3,622 50	
United States treasury department, taxes .....	175 00	
Income account.....	49,509 62	
		\$349,795 32

#### ASSETS.

Construction account.....	\$326,914 21	
Investments .....	14,957 82	
Winslow, Lanier & Co., to pay coupons .....	3,736 44	
Unpaid stock subscriptions.....	750 00	
Pennsylvania Co., operating, June rent .....	1,666 66	
Cash in hand of treasurer .....	1,770 19	
		\$349,795 32

*State of Pennsylvania, County of Allegheny, ss. :*

Thos. D. Messler, President of the Massillon & Cleveland Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

THOMAS D. MESSLER, *President.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 9th day of September, A.D. 1881.

[SEAL.]

FRANK SEMPLE,

*Notary Public.*

# PENNSYLVANIA COMPANY OPERATING MASSILLON AND CLEVELAND RAILROAD.

Name of road: Massillon & Cleveland Railroad.

By whom owned: Massillon & Cleveland Railroad Company.

By whom operated: Pennsylvania Company.

By what authority: Lease.

Name of Company making this report: Pennsylvania Company operating Massillon & Cleveland Railroad.

General office at Pittsburgh, Pa.

Address correspondence relating to this report to J. P. Farley, Auditor, Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS OF PENNSYLVANIA COMPANY OPERATING THIS RAILROAD.

Name.	Office.	Address.	Salary.
Geo. B. Roberts .....	President.....	Philadelphia .....	.....
J. N. McCullough.....	1st Vice President .....	Pittsburgh .....	.....
Wm. Thaw .....	2nd " .....	" .....	.....
Thos. D. Messler .....	3d Vice Pres't and Comptroller .....	" .....	.....
Jno. E. Davidson.....	Ass't Comptroller.....	" .....	.....
S. B. Liggett.....	Secretary .....	" .....	.....
S. W. White .....	Ass't Secretary .....	Philadelphia .....	.....
Wm. H. Barnes .....	Treasurer .....	Pittsburgh .....	.....
J. P. Farley .....	Auditor.....	" .....	.....
D. W. Caldwell.....	General Manager.....	" .....	.....
Wm. A. Baldwin .....	Manager .....	" .....	.....
J. T. Brooks.....	General Superintendent...	" .....	.....
F. Slataper .....	Chief Engineer .....	" .....	.....
E. A. Ford .....	Gen'l Pass'ger and Ticket Agent .....	" .....	.....
Wm. Stewart.....	General Freight Agent....	" .....	.....
J. N. McCullough.....	Executive Committee..	" .....	.....
Wm. Thaw .....		" .....	.....
Thos. D. Messler .....		" .....	.....
Jno. P. Green .....		Philadelphia .....	.....
Wm. H. Barnes .....		Pittsburgh .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Geo. B. Roberts .....	Philadelphia ...	Henry M. Phillips.....	Philadelphia.
J. N. McCullough .....	Pittsburgh .....	J. N. DuBarry.....	" .....
Wm. Thaw .....	" .....	John Price Wetherill...	" .....
Thos. D. Messler .....	" .....	A. J. Cassatt .....	" .....
Henry M. Houston .....	Philadelphia ...	Jno. P. Green.....	" .....
Wistar Morris.....	" .....	Wm. H. Barnes .....	Pittsburgh.
Samuel M. Felton .....	" .....		

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Massillon Junction to Chippewa, O.....	12.23	12.23
Total single main track.....	12.23	12.23
Aggregate of sidings and other tracks.....	1.40	1.40
Total length laid with rail computed as single track.....	13.63	13.63
Length in Ohio, distributed as follows :		

County.	Main track.	Sidings, etc.	Total.
Stark .....	11.239	0.951	12.190
Summit.....	0.99	0.40	1.44
Total .....	12.23	1.40	13.63

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4 ft. 9 in.
Grade—Maximum, per mile.....	21 feet.
Longest maximum.....	2,700 "
Aggregate length of maximum.....	2,700 "
Curvature—Shortest radius.....	1,146.28 "
Aggregate length of shortest radius.....	1,300 "
Aggregate length of all radii.....	6.54 miles.
Aggregate length of tangent.....	5.60 "
Rail—Iron—On road.....	13.63 "
Average weight per yard.....	56 lbs.
Ties—Average number per mile.....	2,816
Ballasted—On whole line.....	13.63 miles.
In Ohio.....	80 "
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Pile, 1; greatest age, not known; length, 304 feet.
Trestles—3; greatest length, 75 feet; aggregate length, 145 feet.
Greatest length of beams between points of support, if not trussed, 14 feet.
Greatest space between cross ties upon bridges and trestles, 6 inches;
length of ties, 9 feet 6 inches.
Number of track-stringers, 6 in wooden bridges.
Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Once a week by bridge foreman and semi-annually by inspectors.

Are the examinations analytical, and are they made by a competent person? Yes.

#### FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	20	20
Kind of fencing, as follows:		
Post and board.....	20	20
Average cost of fencing, \$6,400.		
Average cost of same per rod, \$1.00.		
Length of road unfenced, and the reason therefor: All fenced.		

#### CROSSINGS.

Number of crossings of highways at grade in this State without protection (none without protection), 6.

Number of crossings of highways over railroad—no highway bridges.

#### STATIONS.

Passenger and freight..... 2; in Ohio, 2

#### ROLLING STOCK.

Locomotives .....	2; Average weight.....	65,370 lbs.
Express and baggage cars.....	1; " .....	29,000 "
Passenger cars .....	2; " .....	41,000 "
Freight cars.....	50; " .....	18,000 "

Above are all owned by P. F. W. & C. R'y.

#### Terms of service:

Locomotives, average cost per mile run, and 6 per cent. on value of same.

Passenger, baggage and express cars, 1½ cents per mile run.

Freight cars, ¾ cent per mile run.

Number of locomotives equipped with train brakes: 1.

Kind of brake: Westinghouse air brake.

Number of cars equipped with train brakes: 3.

Kind: Westinghouse air brake.

Number of passenger cars with "Miller Platform": None.

Method of bridging between passenger cars, when two or more are run in trains: By close connecting platforms, joined together with Janney car couples.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: By Driggs and Speer and Bissell safety stoves.

Means of lighting same: By candles and safety oil lamps.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation .....	20      "
Freight trains .....	15      "

## EMPLOYES.

Superintendents .....	1
Engineers .....	2
Baggagemen .....	1
Firemen .....	2
Conductors .....	2
Brakemen .....	5
Station agents .....	2
Section men .....	8

Total number employed by Company in operating line.....	23
Proportion for Ohio .....	23

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives	Passenger .....	16	Rails—Iron .....		5
	Freight .....	15	Joint fastenings.....		12
Cars .....	Passenger .....	12	Frogs .....		1
	Baggage .....	12	Ties—Oak .....		6
	Box .....	10	Bridges—Piling.....		6
	Stock .....	10	Fence posts.....		8
	Coal .....	8			
	Flat... ..				

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile :

	Highest.	Lowest.	Average
For distances less than 8 miles.....	4 Cts.	3 Cts.	3½ Cts.
For distances over 8 miles—1st class.....	3	2	2½
2d class.....	2	1	1½
Emigrant .....	2	1	1½
Excursion .....	2	1	...

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class.....	.024 Cts.	.00577 Cts.	.00442 Cts.
Second class .....	.024	.005	
Third class .....	.024	.005	
Fourth class .....	.020	.00462	
Fifth class.....	.016	.00385	

Rate per ton per mile on freight carried less than 30 miles :

First class .....	.48	.11539	.08838
Second class .....	.48	.10000	
Third class .....	.48	.10000	
Fourth class .....	.40	.09231	
Fifth class .....	.32	.07692	

Rate per ton per mile on freight carried more than 30 miles (Road less than 30 miles long) :

Rate per ton per mile for—

Coal—Carried 10 miles or more.....	.05	.04	.08838
Carried less than 10 miles.....	.18	.0555	
Pig iron—Carried 10 miles or more .....	.05	.05	
Carried less than 10 miles.....	.20	.0555	
Limestone—Carried ten miles or more.....	.05	.04	
Carried less than ten miles.....	.18	.0555	
Iron Ore—Carried ten miles or more.....	.05	.0500	
Carried less than ten miles.....	.18	.0555	
Undressed stone or lumber—Carried 10 miles or more.....	.05	.04	
Carried less than 10 miles.....	.20	.0555	

Rate per 100 lbs. for loading and unloading: No charge made for loading and unloading.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Train mileage—Passenger .....	7,262	
Freight .....	7,482	
Switching freight.....	36	
Construction .....	210	
Total .....		14,990
Car mileage—Passenger.....	11,938	
Express and baggage .....	6,965	
Freight—loaded... ..	17,182	
empty.....	13,788	
Caboose .....	4,848	
Total.....		54,721
Fuel consumed—Wood, 25 cords; coal, 210 tons. Total cost.....		\$352 50

## TRANSPORTATION.

Passengers—Number carried, local .....	5,432
Average number of miles traveled by each.....	8.7
Total mileage, or number carried one mile.....	47,657
Average amount received for each.....	26 1 cts.
Average amount <i>per mile</i> received for each .....	2.9 cts.
Freight—Tons carried, local.....	27,387
Average tons in each loaded car per trip.....	5.43
Average tons in each loaded car per mile .....	5.43
Total movement, or tons carried one mile.....	93,348
Average amount received for each ton.....	30.12 cts.
Average amount <i>per mile</i> received for each ton .....	08.838 cts.
Average cost per ton freight per mile.....	06.344 cts.
Average amount received for each ton local freight.....	30.125 cts.
Average cost each ton local freight .....	01.344 cts.

## Articles transported :

	Tons.	Per cent.
Coal.....	15,097	55.13
Coke .....	22	.08
Stone, lime, sand, etc.....	9,600	35.05
Petroleum.....	6	.02
Pig and bloom iron.....	26	.09
Manufactured iron .....	22	.08
Lumber and other forest products.....	282	.03
Grain, flour, and other agricultural products.....	1,658	.06
Live stock.....	66	.24
Animal products.....	10	.04
Manufactures, including agricultural implements .....	220	.80
Merchandise .....	270	.99
Miscellaneous.....	108	.39
Total tonnage yielding revenue .....		100

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30TH

## EARNINGS.

Passenger transportation—local.....	\$1,418 62
Freight transportation .....	8,250 37
Mail service .....	458 72
<hr/>	
Total earnings of line operated included in this report.....	\$10,127 71

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$2,217 33
Maintenance of cars .....	485 00
Motive power .....	3,185 87
Conducting transportation .....	3,910 91



## General expenses, as follows :

Taxes in Ohio .....	\$791 41	
Salaries .....	3 85	
Other general expenses of operating .....	123 61	
		918 87

Total operating expenses, being 106 per cent. of earnings..... \$10,717 98

Net loss of 12.23 miles operated..... 590 27

## Rentals paid for use of road, track, depots, equipment, etc. :

Amount paid Mass. & Clev. R. R. Co..... 20,000 00

Net loss over operating expenses and rents paid..... 20,590 27

Per mile of earnings..... \$823 10; Proport'n for O. (12.23 miles) 10,127 71

operating expenses 876 37; " " " 10,717 98

deficit ..... 48 27; " " " 590 27

*State of Pennsylvania, County of Allegheny, ss. :*

Thos. D. Messler, Third Vice President of the Pennsylvania Company operating the Massillon and Cleveland Railroad, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

THOS. D. MESSLER,

[SEAL OF R. R.]

*Third Vice President.*

Subscribed and sworn to before me, this 9th day of September A. D. 1881.

FRANK SEMPLE,

[SEAL.]

*Notary Public.*

## NEWARK, SOMERSET & STRAITSVILLE RAILROAD COMPANY.

Name of road: Newark, Somerset & Straitsville Railroad.

By whom owned: Newark, Somerset & Straitsville Railroad Company.

By whom operated: Baltimore & Ohio Railroad Company.

By what authority: Lease.

Name of company making this report: Newark, Somerset and Straitsville Railroad Company.

General office at Newark, Ohio.

Principal office in Ohio at Newark.

Address correspondence relating to this report to J. Hope Sutor, Secretary and Treasurer, at Zanesville, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Given in full in previous reports—nothing new to add.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
David Lee.....	President.....	Zanesville, O.....	.....
J. Hope Sutor.....	Secretary and Treasurer..	".....	.....
W. T. Thelin.....	Auditor.....	Baltimore, Md.....	.....
B. Dunham.....	General Manager.....	Newark, O.....	.....
Jas. L. Randolph.....	Chief Engineer.....	Baltimore, Md.....	.....
C. K. Lord.....	General Passenger Agent..	".....	.....
Frank Harriott.....	General Freight Agent.....	".....	.....
L. M. Cole.....	General Ticket Agent.....	".....	.....
David Lee.....	} Executive Committee. {	Zanesville, O.....	.....
Wm. Keyser.....		Baltimore, Md.....	.....
T. I. Davis.....		Newark, O.....	.....
C. H. Hudson.....		Minneapolis, Minn.....	.....
C. H. Kibler.....		Newark, O.....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Wm. Keyser.....	Baltimore, Md..	T. I. Davis.....	Newark, O.....
Osman Latrobe.....	".....	Wm. Shields.....	".....
Robert Garrett.....	".....	C. H. Kibler.....	".....
David Lee.....	Zanesville, O.....	Wm. Franklin.....	".....
J. C. Larwell.....	Loudonville, O..	W. H. Harrison.....	".....
C. H. Hudson.....	Min'polis, Minn.		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$800,000 00	
preferred .....	263,000 00	
Number of shares—common.....	16,000	
preferred .....	5,260	
Total.....	21,260	
Par value of each—common.....	\$50 00	
preferred.....	50 00	
Increase since June 30, 1880—preferred.....	30,000 00	
Capital stock authorized by vote of Company—common..	\$800,000 00	
preferred	263,000 00	
		1,063,000 00
Amount subscribed—common.....	795,400 00	
preferred.....	218,200 00	
		1,013,600 00
Total paid in capital stock—common.....	\$795,400 00	
preferred .....	218,200 00	
		1,013,600 00
Increase since June 30, 1880—preferred.....	26,650 00	
Average amount paid in per mile of single main track (44 miles).....	23,036 59	
Proportion of same for Ohio (44 miles).....	23,036 59	
Capital stock issued—For original construction and for construction on extension of line or branches, all. Cannot give details.		
Stockholders, residents of Ohio, 248.		
Amount of stock held by them June 30, 1881, \$96,150.		
Agents authorized to transfer stock: J. Hope Sutor, Zanesville, O.		
Number of shares transferred within the year at such agencies, 80.		

## FUNDED DEBT.

Kind of bond or obligations, 1st mortgage; when due, November 1, 1889; rate of interest, 7%; amount actually issued, \$800,000.00.		
Average amount per mile of single main track (44 miles) .....	\$18,181 81	
Proportion of same for Ohio (44 miles).....	All.	

## OTHER INDEBTEDNESS.

Total unfunded debt .....	\$256,901 59	
Net unfunded debt .....	\$256,901 59	
Average amount per mile of single main track.....	\$5,838 67	
Proportion of same for Ohio .....	All.	
Decrease since June 30, 1880.....	982 13	
Total net debt liabilities.....		1,056,901 59
Average amount per mile of single main track.....	\$24,020 49	
Proportion of same for Ohio .....	All.	
Total of paid in stock and debt.....		2,070,501 59
Total average amount per mile .....	\$47,056 85	
Proportion of same for Ohio.....	All.	

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Total expenditures to July 1st, 1881.
Right of way and fencing.....	\$65,300 00
Civil engineering.....	34,000 00
Grading and masonry .....	887,689 09
Bridges .....	
Timber and ties.....	701,646 76
Superstructure.....	
Iron rails, chairs and spikes.....	17,937 84
Passenger and freight stations.....	
Engine and car houses .....	70,676 31
Machine shops, machinery and fixtures .....	
Other buildings and fixtures.....	
Interest and discount .....	
Total expenditures for construction .....	\$1,777,250 00

## COST OF ROAD AND EQUIPMENT OWNED BY COMPANY.

Locomotives, 2.....	\$17,500 00
First-class passenger cars, 1 .....	2,900 00
Freight, construction and other cars, 17.....	10,250 00
Total cost of railroad equipment owned by company.....	\$30,650 00
Average amount per mile of single main track (44 miles).....	69,432 00
Total for road and equipment .....	1,807,900 00
Total average amount per mile (of single main track 44 miles).....	41,088 64
Proportion of same for Ohio (44 miles) .....	All.

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Newark, O., to Shawnee, O .....	44 miles.	44 miles.
Total single main track .....	44 miles.	44 miles.
Aggregate of sidings and other tracks .....	5.82	5.82
Total length laid with rail computed as single track...	49.82 miles.	49.82 miles.
Length in Ohio, distributed as follows :		

County.	Main track.	Sidings, etc.	Total.
Licking .....	10.55	1.50	12.05
Perry .....	33.45	4.32	37.77
Totals .....	44.	5.82	49.82

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 8 $\frac{3}{4}$ in.
Grade—Maximum, per mile .....	90 feet.
Longest maximum .....	2 $\frac{1}{2}$ miles.
Aggregate length of maximum .....	5 $\frac{1}{2}$ "
Curvature—Shortest radius .....	1146 feet.
Aggregate length of shortest radius .....	6484 "
Aggregate length of all radii .....	15 miles.
Aggregate length of tangent .....	29 "
Rail—Iron—On road .....	44 "
Weight per yard .....	54 & 62 lbs.
Ties—Average number per mile .....	3,000
Number laid during the year .....	31,486
Ballasted—On whole line .....	44 miles.
In Ohio .....	44 "
With stone, 26 miles; gravel, 14 miles; cinder, 4 miles.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood—14; greatest age, 10 years; aggregate length, 768 feet.
Trestles—6; greatest age, 10 years; greatest height, 36 feet; greatest length, 555; aggregate length, 2,000 feet.
Length of shortest span of truss, 32 feet; of longest, 121 feet; greatest length of beams between points of support, if not trussed, 15 feet.
Greatest space between cross ties upon bridges and trestles, 10 inches; length of ties, 9 feet.
Number of track stringers, 2 in bridges and 3 in trestles under each rail.
Are all bridges and trestles provided with guard rails? Partially.
Do all bridges and trestles receive stated examinations? Yes.
How often? Daily by trackmen; monthly by superintendent of bridges.
Are the examinations analytical, and are they made by a competent person? Yes.
Tunnels—Wood—1; length, 1,100 feet.

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Stock .....	\$1,013,600 00
Bonds .....	800,000 00
Floating debt .....	256,901 59
Total .....	\$2,070,501 59

## ASSETS.

Construction account .....	\$1,777,250 00
Equipment .....	30,650 00
Balance .....	262,601 59
Total .....	\$2,070,501 59

*State of Ohio, County of Muskingum, ss. :*

David Lee, President of the Newark, Somerset and Straitsville Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

DAVID LEE,

*President.*

Subscribed and sworn to before me, this 15th day of December, A. D. 1881.

FRANK DURBAN,

[SEAL.]

*Notary Public within and for said county.*

# BALTIMORE AND OHIO RILROAD COMPANY OPERATING NEWARK, SOMERSET AND STRAITSVILLE RAILROAD.

Name of road: Newark, Somerset and Straitsville Railroad.

By whom owned: Newark, Somerset and Straitsville Railroad Company.

By whom operated: Baltimore and Ohio Railroad Company.

By what authority: Lease.

Name of company making this report: - Baltimore and Ohio Railroad Company.

General office at Baltimore, Md.

Principal office in Ohio at Newark, Ohio.

Address correspondence relating to this report to J. Hope Sutor, Secretary and Treasurer, at Zanesville, Ohio.

## CHARACTERISTICS, ETC.

### LINE IN OPERATION.

	Length.	In Ohio.
Single main track—Newark, Ohio, to Shawnee, Ohio.....	44 miles	44 miles.
Total single main track.....	44	44
Aggregate of sidings and other tracks.....	5.82	5.82
Total length laid with rail computed as single track.....	49.82	49.82
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Licking .....	10.55	1.50	12.05
Perry.....	33.45	4.32	37.77
Totals .....	44.00	5.82	49.82

### GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 8 $\frac{3}{4}$ in.
Grade—Maximum, per mile.....	90 feet.
Longest maximum.....	2 $\frac{1}{2}$ miles.
Aggregate length of maximum.....	5 $\frac{1}{2}$ "
Curvature—Shortest radius .....	1146 feet.
Aggregate length of shortest radius.....	6481 "
Aggregate length of all radii.....	15 miles.
Aggregate length of tangent .....	29 "

Rail—Iron—On road.....	44 miles.
Average weight per yard.....	54 and 62 lbs.
Ties—Average number per mile.....	3,000
Number laid during the year.....	31,846
Ballasted—On whole line.....	44 miles.
In Ohio.....	44 "
With stone, 26 miles; gravel, 14 miles; cinder, 4 miles.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—14; greatest age, 10 years; aggregate length, 768 ft.  
Trestles—6; greatest age, 10 years; greatest height, 36 feet; greatest length, 555 ft.; aggregate length, 2,000 ft.  
Length of shortest span of truss, 32 feet; of longest, 121 feet; greatest length of beams between points of support, if not trussed, 15 feet.  
Greatest space between cross ties upon bridges and trestles, 10 inches; length of ties, 9 feet.  
Number of track stringers, two in bridges and three in trestles under each rail.  
Are all bridges and trestles provided with guard rails? Partially.  
Do all bridges and trestles receive stated examinations? Yes.  
How often? Daily by trackmen; monthly by Superintendent of Bridges.  
Are the examinations analytical, and are they made by a competent person? Yes.  
Tunnels—Wood—1; aggregate length, 1100 feet.

## FENCING—AVERAGE AND AGGREGATE COST.

Kind of fencing, as follows:

Post and board (average cost per rod, \$1.00).

Average cost of same per rod, \$1.

Length of road unfenced, and the reason therefor: 34.75; landowners have agreed to build fences, and about two miles of the distance is through towns, etc., where fence cannot be erected.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?  
Cincinnati and Muskingum Valley R. R. at Junction City.  
Number of crossings of highways at grade in this State without protection, 30.  
" " " over railroad, 2.  
Number of highway bridges 18 feet above track (36 feet), 1.  
" " " less than 18 feet above track (17 feet 9 inches), 1.  
Do all trains stop at railroad crossings as required by law? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated—all in Ohio.....	44
Miles of same owned by railroad company—all in Ohio .....	44



## STATIONS.

Passenger and freight .....	13 ; in Ohio, 13
Number with telegraph communication.....	4 ; " 4
Number of same operated by railroad company.....	4 ; " 4

## ROLLING STOCK.

Locomotives, 13 ; average weight, 122,032.
All rolling stock furnished by B. & O. R. R.
Number of locomotives equipped with train brakes, 3.
Kind of brake: Loughridge air brake.
Number of cars equipped with train brakes: All passenger, baggage and mail cars.
Kind: Loughridge air brake.
Number of passenger cars with Miller Platform, none.
Method of bridging between passenger cars, when two or more are run in trains:
Movable wooden bridges, secured by a chain.
State methods of heating cars used for the transportation of passengers: Baker's
patent heaters and wood stoves with door locks.
Means of lighting same: Mineral, sperm oil and candles.

## SPEED OF TRAINS.

Mail and accommodation, average rate, including stops.....	22 miles per hour.
Freight trains, " " .....	11 "

## EMPLOYES.

Superintendents (General Manager, 1 ; Master of Transportation, 1 ;	
Master of Road, 1 ; Ass't Master of Road, 1 ; Master of Machinery, 1)	5
Telegraph operators .....	3
Engineers .....	7
Baggagemen .....	2
Flagmen, switch-tenders and watchmen.....	6
Laborers .....	43
Clerks .....	9
Train dispatchers.....	1
Firemen .....	9
Wipers .....	4
Mechanics .....	78
Conductors.....	7
Brakemen .....	9
Station agents .....	12
Section men.....	66
Other employees .....	5

Total number employed by company in operating line .....	266
Proportion for Ohio.....	266

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: B. & O. runs its own express.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.	Average life in years.	Equipment and superstructure.	Average life in years.
Locomotives .....	<div> <div> { Passenger .....  Freight..... </div> <div> Cannot say. </div> </div>	<div> <div> Rails ..... </div> <div> { Iron .....  Steel—None in use. </div> </div>	7
Cars.....	<div> <div> { Passenger .....  Baggage.....  Box .....  Stock .....  Coal .....  Flat ..... </div> <div> Cannot say. </div> </div>	<div> <div> Joint fastenings—Not used long enough to say.  Frogs.....  Ties—Oak .....  Bridges—Wooden .....  Telegraph poles—Cedar.....  Fence posts..... </div> </div>	<div> 3  6  15  8  8 </div>

## DOINGS OF THE YEAR ENDING JUNE 30.

Bridges rebuilt in Ohio, as follows:

Location or how designated—Trussed girder, No. 7; construction, wooden; length, 32 feet.

Trestles rebuilt in Ohio, 2; aggregate length, 144 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, \$1.00), 65.

Ballasting—Miles of main track rebalasted with stone, 208 ft., gravel, 200 ft., .07.

Rail laid—New iron, 60 lbs. per yard—miles of track, 64.

2d hand iron, 62 lbs. per yard—miles of track, 5.30.

Train mileage—Passenger .....	54,696	
Freight .....	104,985	
Construction, not kept.		
Total.....		159,681
Car Mileage—Passenger .....	115,005	
Express and baggage .....	451	
Freight—loaded.....	1,156,017	
empty .....	991,354	
Construction and other, not kept.		
Total .....		2,262,827
Fuel consumed—Wood, 183 cords; coal, 10,738 tons. Total cost .....		\$12,213 41

## TRANSPORTATION.

Passengers—Total number carried—local .....	42,356
Average number of miles traveled by each.....	20.5
Total mileage, or number carried one mile .....	868,298
Average amount received for each .....	55 $\frac{8}{10}$ cts.
Average amount <i>per mile</i> received for each .....	2.72 cts.



## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880				
1	Nov. 18	P. Kennedy..	Brakeman...	Coupling .....	Hand injured.
2	13	R. Blake .....	Citizen .....	Sitting on track; struck by train.....	Head slightly injured and body bruised.
	1881				
3	Mch. 9	Amos Frey...	Brakeman...	Fell from train .....	Slightly injured.

## SUMMARY OF ACCIDENTS.

## PERSONS INJURED—CAUSES.

Employees—Getting on or off engine or train in motion .....	1
Coupling, or caught between cars and engine.....	1
Falling or thrown from engine or train .....	1
—	3
Others—Lying, walking, falling, or being on track.....	1
—	—
Total.....	4

## RECAPITULATION.

Injured—Employees—from causes beyond their control.....	2
misconduct or want of caution.....	1
—	3
Others—trespassing on track.....	1
—	—
Total injured.....	4

## TRAIN ACCIDENTS—ENTIRE LINE.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1880.				
Sept. 1	Bristol .....	Freight.....	Collision; train broke in two...	3 dumps and 4 gondola cars damag'd.
Oct. 16	Lee's Siding ..	" .....	Collision; butting.....	9 dump cars and 2 engines damaged.
22	Shawnee.....	" .....	" car ran from siding...	1 box car damaged.
Nov. 15	Bristol.....	" .....	" runaway engine.....	1 engine and 1 coal car damaged.
1881.				
Jan. 11	Bristol.....	" .....	" train broke in two...	2 gondolas and one dump car dam'g'd.
Feb. 5	Wilson's.....	" .....	" rear .....	1 caboose and 2 box cars damaged.

## SUMMARY OF TRAIN ACCIDENTS.

Number :

Collisions—butting.....	1
other .....	4
rear .....	1
—	—
Total accidents .....	6

## Causes of collisions :

Cars blown or run from siding.....	1
Runaway engine.....	1
Train breaking in two.....	2
Other causes.....	2
Total.....	6

*State of Ohio, County of Licking, ss. :*

B. Dunham, General Manager of the Baltimore and Ohio Railroad, operating the Newark, Somerset and Straitsville Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

B. DUNHAM, *General Manager.*

[SEAL OF R. R.]

Subscribed and sworn to before me this 8th day of November, A. D. 1881.

[SEAL.]

EDWARD KIBLER,

*Notary Public for Licking County, O.*

## NEW YORK, PENNSYLVANIA & OHIO RAILROAD COMPANY.

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Name of road: New York, Pennsylvania & Ohio Railroad.

By whom owned: New York, Pennsylvania & Ohio Railroad Company.

By whom operated: New York, Pennsylvania & Ohio Railroad Company.

By what authority: Charter.

Name of company making this report: New York, Pennsylvania & Ohio Railroad Company.

General office at Cleveland, O.

Principal office in Ohio at Cleveland, Ohio.

Address correspondence relating to this report to Thomas Warnock, Auditor, at Cleveland, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

A lease was made to this company by the Cleveland & Mahoning Valley Railway Company of its several lines, viz.: the Cleveland & Mahoning Railroad, the Niles & New Lisbon Railway and the Liberty & Vienna Railroad. The lease is dated 4th May, 1880, and is for the full term of 82 years and 3 months, from and after the 1st July, 1880, at a rental of \$357,180 per year, for the period beginning 1st July, 1880, to 1st January, 1885, and at the rate of \$412,180 per year for the period beginning 1st January, 1885, and ending 1st October, 1962. This company commenced to operate these several properties under this lease on 1st July, 1880. The President of the Cleveland & Mahoning Valley Railway Company is the Hon. Stephen Burke, Cleveland, Ohio. This company commenced on 23d May, 1881, to operate under an existing lease with the Sharon Railway, an extension of that company's road from a point near the town of Sharon, Pennsylvania, to the town of Middlesex, in same State, a distance of 6.39 miles; the rental is at the rate of 7.310 per cent. on the cost of the property. But, as the Sharon Railway has not yet arrived at the cost of the extension, the definite figures for the annual rental can not be given. The President of the Sharon Railway is Mr. George Boyce, of Sharon, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. H. Devereux.....	President.....	Cleveland, O .....	.....
J. H. Wade.....	Vice-President.....	" .....	.....
Thomas Warnock.....	Secretary.....	" .....	.....
Fred. E. Rittman.....	Treasurer.....	" .....	.....
Thomas Warnock .....	Auditor .....	" .....	.....
P. D. Cooper .....	General Superintendent...	" .....	.....
Chas. Latimer.....	Chief Engineer .....	" .....	.....
Wm. B. Shattuc .....	General Passenger Agent..	" .....	.....
Geo. G. Cochran.....	General Freight Agent.....	" .....	.....
J. H. Devereux.....	{ Executive Committee. }	" .....	.....
J. H. Wade .....		" .....	.....
James F. Clark.....		" .....	.....
Jno. Todd .....		" .....	.....
J. M. Adams .....		" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
J. H. Devereux.....	Cleveland, O.....	H. B. Payne.....	Cleveland, O.
J. H. Wade .....	" .....	P. D. Cooper .....	" .....
Jno. Todd.....	" .....	Geo. Boyce .....	Sharon, Pa.
Jas. F. Clark .....	" .....	H. B. Perkins .....	Warren, O.
J. M. Adams .....	" .....	A. G. Dulman.....	New York City.
S. L. Mather .....	" .....	W. W. McFarland.....	" .....
R. P. Ranney.....	" .....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$35,000,000 00	
preferred .....	10,000,000 00	
		\$45,000,000 00
Number of shares—common .....	700,000	
preferred .....	200,000	
		900,000
Par value of each—common .....		\$50 00
preferred .....		50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$35,000,000 00	
preferred .....	10,000,000 00	
		\$45,000,000 00
Amount subscribed—common.....	\$34,999,350 00	
preferred.....	10,000,000 00	
		\$44,999,350 00

Total paid in capital stock—common (used in payment of the property).....	\$34,999,350 00	
preferred .....	10,000,000 00	
		\$44,999,350 00
Average amount paid in per mile of single main track (423.240 miles)..		106,321 12
Proportion of same for Ohio (247.824 miles) .....		26,348,925 26

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For purchase of company's road, No. shares, 899,987; amount of common, \$34,999,350; amount of preferred, \$10,000,000.

Stockholders, residents of Ohio, 10.

Amount of stock held by them June 30, 1881, \$500.

Agents authorized to transfer stock: Thomas Warnock, Cleveland, O.; Farmers' Loan & Trust Company, New York.

Number of shares transferred within the year at such agencies, 899,974.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. Rate of interest.	5. Amount of authorized issue.	6. Amount actually issued.
Prior lien.....	On all the property of the company's and any it may acquire hereafter.]	May 5, 1880	6	\$8,000,000 00	\$8,000,000 00
1st mortgage.....		6, 1880	7	35,000,000 00	34,879,000 00
Second mortgage.....		7, 1880	5	14,500,000 00	13,680,000 00
Third .....		7, 1880	5	30,000,000 00	29,000,000 00
Deferred warrants issued for unpaid interest on first mortgage bonds to be exchanged on presentation in amounts of \$1,000 for first mortgage bonds.....					1,273,015 00
Total .....				\$87,500,000 00	\$86,832,015 00

Total average amount per mile of single main track (423.24 miles).....	\$205,160 23
Proportion of same for Ohio (247.824 miles).....	50,843,626 36
Increase since June 30, 1880, on the issue.....	86,830,015 00

## OTHER INDEBTEDNESS.

All other debts, current credits balances, etc.....	\$838,839 21
Total unfunded debt.....	838,839 21
Cash securities, debit balances, etc., available to payment..	869,829 93
Surplus.....	\$30,990 72
Total net liabilities.....	86,801,024 28
Average amount per mile of single main track.....	\$205,087 00
Proportion of same for Ohio.....	50,825,480 68
Total of paid in stock and debt .....	131,800,374 28
Total average amount per mile.....	311,408 12
Proportion of same for Ohio.....	77,174,405 93



## COST OF ROAD EQUIPMENT, Etc.

The road and equipment were purchased as a whole 6th of January, 1880, and there are no data to give the details as asked for on this page.

Total expenditures for purchase, construction and equipment..... \$131,748,563 61

## ROAD ACQUIRED BY PURCHASE.

Original cost (cannot tell) ; purchased for (estimated).....	\$127,477,503 15
Subsequent expenditures for construction (partly estimated).....	4,271,060 46
Total expended for construction and purchase .....	131,748,563 61
Average cost per mile of road owned by company (single main track, 423.24 miles).....	311,285 71
Proportion of same for Ohio (247.824 miles).....	77,144,069 79

## EQUIPMENT OWNED BY COMPANY.

Two hundred and twelve locomotives, 51 first-class passenger cars, 25 second-class passenger cars, 18 combination cars, 1,582 box freight cars, 152 stock cars, 2,569 platform and coal cars, 29 baggage and express cars, 8 mail and express cars, 3 postal cars, 133 section cars, 146 hand-cars, 1 snow plow, 102 caboose cars, 1 Directors and Superintendent's car, 1 pay-car, 26 dump cars, 15 wrecking cars, tool cars, and pile driver. See page 7—the value is included in the table of construction.

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—Salamanca, N. Y. to Dayton, O.....	387.906	246.270
Franklin Branch, near Meadville, Pa., to Oil City, Pa.....	33.780	.....
Silver Creek Branch, near Wadsworth, O. to Silver Creek, O.....	1.554	1.554
Total single main track.....	423.240	247 824
Third rail—Salamanca, N. Y., to Franklin Branch Junction, Pa., main track, 105.250 miles, equal to .....	52.625	.....
Aggregate of sidings and other tracks .....	111.516	59.853
Total length laid with rail computed as single track .....	587.381	307.677
Laid with steel rail.....	348.722	164,966
Length in Ohio, distributed as follows:		

County.	Main track.	Branches.	Sidings, etc.	Total.
Trumbull.....	29 630	.....	6 107	35.737
Portage.....	22.882	.....	10.089	32.971
Summit.....	19.342	0.155	6.865	26.362
Medina.....	7.041	1.399	2.101	10.541
Wayne.....	18.950	.....	2.894	21.844
Ashland.....	20.911	.....	2.744	23.655
Richland.....	20.538	.....	3 311	23.849
Crawford.....	5.899	.....	6.881	12.780
Morrow.....	2.298	.....	.....	2.298
Marion.....	25.238	.....	2.292	27.530
Union.....	23.909	.....	4.525	28.434
Champaign.....	21.276	.....	5.195	26.471
Clarke.....	18.256	.....	0.978	19.234
Green.....	4.893	.....	0.687	5.580
Montgomery.....	5.207	.....	5.184	10.391
Totals.....	246.270	1.554	59.853	307.677
Steel rail.....	164.966	.....	.....	164.966

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Cleveland and Mahoning Valley Railway.....	124.896 miles.	123.896 miles.
Westerman Railroad, State Line to Sharon, Pa.....	2.092 "	0.615 "
Sharon Railway.....	17.192 "	.....
Total single track.....	144.180 miles.	125.511 miles.
Sidings and other tracks.....	57.554 "	53.537 "
Total.....	201.734 miles.	179.048 miles

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	418½ feet.
Grade—Maximum, per mile.....	103½ feet.
Longest maximum.....	400 "
Aggregate length of maximi.....	400 "
Curvature—Shortest radius.....	748 "
Aggregate length of shortest radii.....	1,741 "
Aggregate length of all radii.....	145.67 mi.
Aggregate length of tangents.....	405.76 mi.
Rail—Iron—On road, including leased lines.....	194.484 mi.
Average weight per yard.....	60 lbs.
Steel—On road, including leased lines.....	371.538 mi.
Average weight per yard, 56, 60, 64, 68.....	60 lbs.
Ties—Average number per mile.....	2,640
Number laid during the year.....	243,054
Ballasted—On whole line.....	567.39 mi.
In Ohio.....	371.17 mi.
With gravel and furnace cinders.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	45;	greatest age....	15 years;	aggregate length, ft..	5,053
Iron.....	15;	"	26	"	1,579
Stone arch	4;	"	...	"	.....

Total..... 6,632

Trestles—56; greatest age, 10 years; greatest height, 33 ft.; greatest length, 520; aggregate length, 6,403.

Length of shortest span of truss, girder, 24 ft.; of longest, 31 ft.; greatest length of beams between points of support, if not trussed, 18 ft. 6 in., with corbels.

Greatest space between cross ties upon bridges and trestles, 3 inches; length of ties, 12 feet.

Number of track-stringers, 4.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Have no stated time.

How often? A competent man examines every bridge at least once a week.

Are the examinations analytical, and are they made by a competent person? By a competent bridge superintendent often and closely.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	1,016	743
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.20) }	966	743
Rail (average cost per rod, \$1.15) .....		
Wire (average cost per rod, 75 cts.) .....	50	.....
Average cost of same per rod.....	.....	\$1 03½
Length of road unfenced, and the reason therefor: All fenced when required.		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Mahoning Coal Road at Latimer and Youngstown, O.

Ash. & Pittsburgh R. R. at Warren.

Painesville and Youngstown R. R. (3 ft. gauge) at Warren and Niles.

Clev. & Pittsburgh R. R. at 3 miles west of Ravenna and at Newburgh.

Clev., Mt. V. & C. R. R. at Akron.

Clev., Tus. Valley & W. R. R. at Russell.

Pitts., Ft. W. & C. R. R. at Mansfield and Leetonia, O. (2).

Clev., Col., Cin. & I. R'y at Galion, 2; Marion, 1; Dayton, 1.

Lake Erie Div. of B. & O. R. R. at Mansfield, O., 2.

Col. & Toledo R. R. at Marion, O.

Cin., San. & C. R. R. at Urbana, O.

Col., Chi. & I. C. R. R. at Urbana, O.

L. E., A. & W. R. R. at Braceville.

What railroads cross your road either over or under your grade in this State, and where?

Connotton R'y (over) at Kent, O.

Ash. & Pittsburg R'y (under) at Warren, O.

Number of crossings of highways at grade in this State without protection, 379.

" " " at which there are gates or flagmen, 2.

Number of crossings of highways over railroad, 22.

" " " under railroad, 30.

" highway bridges 18 feet above track, 22.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated.....	543 ; in Ohio, 359½
Miles of same owned by railroad company.....	543 ; " 359½

### STATIONS.

Passenger and freight.....	115 ; in Ohio, 71
Number with telegraph communication.....	105 ; " 66
Number of same operated by railroad company.....	105 ; " 66

Is pay received for messages sent over line owned by railroad company? Yes.

## ROLLING STOCK.

Locomotives .....	216 ; Average weight.....	129,000 lbs.
Express and baggage cars 37 ;	" .....	28,000 "
Passenger cars .....	94 ;	40,000 "
Parlor cars, 4 } .....	19 ;	{ Parlor, 40,000 } { Sleeper, 65,000 } { Hotel, 60,000 } ..... 55,000 "
Sleeping " 10 }		
Hotel " 5 }		
Freight cars.....	4808 ;	18,000 "
Other cars.....	126 ;	15,000 "
Postal cars .....	3 ;	35,000 "

Above includes not owned by company reporting.

Locomotives.....	4 ; owned by Clev. & Mahoning V'y R'y Co.
Passenger cars.....	2 ; " " "
Hotel, 5 ; sleeping, 10 ; total .....	15 ; " Pullman Palace Car Co.
Parlor .....	2 ; " Woodruff Sleeping & Parlor Car Co.
Freight cars.....	374 ; " Clark, Post & Martin.
" .....	112 ; " Clev. & Mahoning V'y R'y.

Terms of service: Pullman Palace Car Co. is paid 3 cents, and Woodruff Sleeping and Parlor Car Co. is paid  $2\frac{1}{2}$  cents per mile run.

The terms of service of the rolling stock leased from Cleveland and Mahoning Valley R'y Co. is included in the rental for the whole property.

The terms of service for the rolling stock leased from Clark, Post & Martin is, that 10 % of the value of the cars is paid on the delivery of them to the company, and a monthly payment of \$21,695.51 is to be made, and after 84 payments are made the cars become the property of this company.

Number of locomotives equipped with train brakes, 41.

Kind of brake: Westinghouse automatic air brake, 39 Card steam brake, 2.

Number of cars equipped with train brakes, 127.

Kind: Westinghouse automatic air brake.

Number of passenger cars with Miller Platform: 127.

Method of bridging between passenger cars, when two or more are run in trains: Miller platform and buffer.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Use wood stoves, and Winslow safety and Baker's heaters for anthracite coal, all well protected with zinc in day coaches. Baker's heaters in sleeping, hotel and parlor cars.

Means of lighting same: Mineral sperm or other 300° fire test oil, in metal lamps.

#### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	28 miles per hour.
Mail and accommodation.....	20       "
Freight trains .....	12       "

#### EMPLOYES.

Superintendents .....	5
Telegraph operators.....	100
Engineers .....	185
Baggagemen.....	41
Flagmen, switch-tenders and watchmen .....	287
Laborers .....	1,615
Clerks .....	259
Train dispatchers.....	12
Firemen .....	200
Wipers .....	72
Mechanics .....	663
Conductors .....	179
Brakemen .....	573
Station Agents .....	113
Section men and track foremen.....	131
Other employes .....	365

Total number employed by company in operating line .....	4,800
Proportion for Ohio (about).....	2,987

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: The United States Express and the Adams Express.

Terms: The United States Express Company pays double first class rates on local, and on, to and from points west of this line, and about one and one-half second class to and from points east of this line. The Adams Express Company pays 27 cents per 100 lbs. on all express matter carried.

Special freight and transportation lines: Great Western Dispatch Co., Erie & Pacific Dispatch Co., Wabash & Erie Line.

Terms as to rates (use of track, machinery, repair of cars,) etc., with each: They are co-operative lines. The expenses of operating the lines are paid by the different Companies on whose roads the lines are operated, in proportion to the earnings of each road.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives	{ Passenger .....	20	Frogs—Good steel rail .....		7
	{ Freight .....	20	Ties—Oak—White .....		8
Cars .....	{ Passenger .....	15	Bridges .....	{ Wooden—Uncovered .....	9
	{ Baggage .....	15		{ Iron—None worn out .....	
	{ Box .....	15		{ Calc'l'd to last 200yrs .....	
	{ Stock .....	15		{ Trestles .....	8
	{ Coal .....	12		{ Piling .....	8
Rails .....	{ Flat .....	12	Telegraph poles {	{ Cedar .....	15
	{ Iron .....	3		{ Other—Chestnut .....	12
	{ Steel .....	21	Fence posts—Chestnut .....		10
Joint fastenings—As long as the rail .....					

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles .....	5 Cts	3 Cts.	4 Cts.
Over 8 miles—First class .....	3	2.97	2.98½
Second class .....	2.5	1.5	2
Emigrant .....	1	1	1

Excursion rate differs, according to number of passengers and the object of the excursion.

Amount charged in addition to regular fares, in sleeping or other cars run on your road: For seat, 25 to 75 cents; berth, \$2; section, \$4; state room, \$4.

## FREIGHT.

Rate per 100 lbs. per mile when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class.....	55 Cts.	8 Cts.	31.5 Cts.
Second class.....	43	7	25
Third class.....	33	6	19.5
Fourth class.....	29	5	17
Fifth class.....	19.25	4	11.625
Special class.....	15.75	3	9.375

Rate per ton per mile an freight carried less than 30 miles:

First class.....	80	8.33	44.165
Second class.....	70	6.90	38.450
Third class.....	60	5.52	32.760
Fourth class.....	50	4.83	27.415
Fifth class.....	40	3.45	21.725
Special class.....	30	2.76	16.380

Rate per ton per mile on freight carried more than 30 miles :

First class.....	8	1.80	4.900
Second class.....	6.45	1.54	3.995
Third class.....	5.16	1.27	3.215
Fourth class.....	4.51	1.09	2.800
Fifth class.....	3.32	.90	2.065
Special class.....	2.58	.31	1.445

Rate per ton per mile for—

Coal—Carried ten miles or more.....	5	.614	2.807
carried less than ten miles.....	25	3.125	14.062
Pig iron—Carried ten miles or more.....	5	.575	2.787
carried less than ten miles.....	25	3.125	14.062
Limestone—Carried ten miles or more.....	5	1.215	3.107
carried less than ten miles.....	25	3.125	14.062
Iron ore—Carried ten miles or more.....	5	1.149	3.074
carried less than ten miles.....	25	3.125	14.062
Undressed stone or lumber—Carried ten miles or more.....	5	.646	2.823
carried less than ten miles...	25	5.555	15.277

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length.
No. 31, Warren.....	Rivited Warren Truss, deck...	Iron .....	278 feet.
No. 32, 1 mile north Levittsburg..	Pin connected, through.....	" .....	141 "
No. 36, 2 miles north Akron.....	Parabolic plate girder.....	" .....	59 "
No. 41, $\frac{3}{4}$ mile east Burbank.....	Pin connected, through.....	" .....	95 "
No. 44, 1 mile north Burbank.....	Plate girder, through.. . . .	" .....	60 "
No. 47, 1 mile north Wincher.....	Parabolic plate girder.....	" .....	62 "
No. 51, 3 miles east Galion.....	Plate girder, through.....	" .....	60 "

Fencing in Ohio—Miles of single fence built (average cost per rod, 84c.)..... 46,385  
 Ballasting—Miles of main track ballasted with small quantities gotten out to keep track in proper surface.

		In Ohio.
Rail laid—Steel, 60 lbs. per yard—miles of track.....	76,525	75,046
Train mileage—Passenger.....	1,318,973	
Freight .....	4,265,060	
Mixed .....	1,427,152	
Construction.....	119,124	
Total .....		7,130,309
Car mileage—Passenger.....	4,947,762	
Express and baggage .....	1,642,672	
Freight—loaded .....	50,639,758	
empty .....	16,679,007	
Caboose.....	3,054,245	
Construction and other .....	310,247	
Total .....		77,273,691
Fuel consumed—Wood, 11,857.29 cords; coal, 232,063 $\frac{1,607}{32,000}$ tons. Total cost.....		\$494,402 41
Losses, etc., paid—On goods and baggage.....		4,217 16
For injuries in Ohio, fatal and non-fatal:		
to employes.....	836 58	
to others.....	100 00	
Medical attendance, etc.....	1,434 35	
Total.....		2,370 93
For animals killed in Ohio:		
Cattle, 20.....	394 00	
Sheep, 36.....	118 00	
Total .....		\$512 00

## TRANSPORTATION.

Passengers—Number carried, local.....	1,149,162	
through .....	215,340	
Total.....		1,364,502
Average number carried in each car per trip .....		11.7
Average number of miles traveled by each.....		42.6
Total mileage, or number carried one mile .....		58,122,263
Average amount received for each.....		85.3 cents.
Average amount <i>per mile</i> received for each .....		2.03 cents.
Freight—Tons carried, local.....	2,728,693	
through .....	1,920,441	
Total .....		4,649,134





## General expenses:

Taxes in Ohio.....	\$79,057 37	
Pennsylvania .....	\$13,776 80	} 27,393 37
New York .....	13,612 95	
Iowa .....	3 62	
		106,450 74
Salaries .....		147,105 08
Other general expenses of operating.....		24,196 20
		<hr/>
Total operating expenses, being 70.45 per cent. of earnings.....		\$3,948,306 41
		<hr/>
Net earnings of 567.420 miles operated.....		\$1,656,163 52

## Rentals paid, etc.:

Cleveland and Mahoning Valley Railway Co. lines.....	\$359,522 66	
Sharon Railway.....	28,530 80	
Westerman Railroad.....	3,000 00	
Dayton yard, tracks, etc.....	725 04	
Docks, lots, and depots.....	9,185 56	
Equipments .....	283,852 82	
		<hr/>
		684,816 88
		<hr/>
Net income over operating expenses and rents paid.....		\$971,346 64
Percentage of same to capital stock and debt.....	0.73697	
Per centage of to total means applied to construction, etc.....	0.73727	
Per mile of earnings.....	\$9,877 11; Proportion for Ohio (373.335 miles)	3,687,470 86
operating expenses	6,958 34;                      "                      "                      (373.335 miles)	2,597,791 86
		<hr/>
Net earnings .....	\$2,918 77;	\$1,089,679 00

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Bonds issued pre-payment of the property estimated..	\$72,380,000 00	
Payments on capital stock for payment of the property	44,999,350 00	
Sale of bonds of company estimated..	12,800,000 00	
Bonds issued for deferred warrants.....	279,000 00	
Deferred warrants issued.....	1,273,015 00	
Sale of real estate and other portions of the purchased property .....	208,775 04	
		<hr/>
		\$132,040,140 04

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$2,563,265 00	
Premiums and commissions for paying coupons and signing additional bonds .....	2,500 00	
Interest on floating debt.....	1,952 76	
Construction of new work } Additional equipment..... } Estimated.....	4,183,784 19	
Additional real estate..... }		
Cost of property purchased, estimated .....	127,477,503 15	
		<hr/> \$134,229,005 10

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Common stock .....	\$34,999,350 00	
Preferred stock.....	10,000,000 00	
Prior lien bonds.....	8,000,000 00	
First mortgage bonds.....	34,879,000 00	
Second       ".....	13,680,000 00	
Third        ".....	29,000,000 00	
Deferred warrants bonds .....	1,273,015 00	
Special fund for additions in 1880.....	96,344 67	
"       "       1881.....	39,111 93	
Due other companies and individuals.....	629,780 46	
Interest on funded debt due and accrued.....	209,058 75	
Surplus income in 1880.....	79,513 70	
Profit and loss in 1881.....	115,622 65	
		<hr/> \$133,000,797 16

## ASSETS.

Cost of property purchased, estimated.....	\$127,462,239 83	
Construction and equipment.....	4,135,603 86	
Additions in year 1880.....	96,344 67	
"       1881.....	39,111 93	
Cost of cars under car trust.....	19,662 29	
Assets and liabilities of receiver.....	15,263 32	
Third railway track—sidings .....	68,478 00	
Stock of other companies.....	87,180 00	
Supplies on hand.....	512,741 23	
Cash and balances due by agents.....	268,587 15	
Due by companies and individuals.....	295,584 78	
		<hr/> \$133,000,797 16

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1880.				
July 12	Jas. McNiel.....	.....	Jumped on track ahead of train.....	Killed.
31	Wm. Miller.....	.....	Trespassing on track.....	Injured; collar bone broken. " hand crushed.
August 3	John Dorsey, child.....	.....	"	Killed.
4	John Sullivan.....	Brakeman	Jumping on train.....	Injured; three fingers crushed.
16	H. M. Sullivan.....	Section man	Coupling.....	Killed.
24	Geo. Icely.....	.....	Carelessness.....	Injured; three fingers off.
26	Chas. Cook.....	Brakeman	"	" collar bone broken. " arm broken.
	Mrs. D. Runkenbrod.....	.....	Thrown from car.....	Killed.
Sept. 10	Thos. Hogan.....	Switchman	Trespassing.....	"
21	A. Nemetz, child.....	.....	"	"
28	Jas. Reilly.....	Brakeman	.....	"
Oct. 6	Chas. Weaver.....	Brakeman	.....	"
6	M. Gueame.....	.....	.....	"
11	J. S. Felsing.....	Brakeman	Trespassing on track.....	Injured; arm broken.
18	John Morrison.....	"	Coupling; want of caution.....	Killed.
20	Wm. Sexton.....	Yard man	Knocked from car by elevator track.....	Injured; shoulder bone broken.
31	F. Richards.....	Brakeman	Stumbled over a track.....	" two fingers off.
	W. H. Lamoreaux.....	"	Coupling.....	Killed.
Nov. 2	Wm. Smith.....	Switchman	Jumping on front end of caboose.....	Injured; one finger off.
23	John Trapp.....	Brakeman	Coupling.....	" two fingers broken.
Dec. 1	Albert Hershey.....	"	"	" arm badly injured.
3	John P. Clark.....	.....	Climbing between cars.....	Leg crushed.
3	Wm. Hiltabiddle.....	Conductor	Section behind him ran into caboose.....	Killed.
10	Chas. Lynn.....	.....	Walking on track.....	"
16				
1881.				
Jan. 1	Bruce Wallace.....	Brakeman	Coupling.....	Hand injured.
3	T. M. Williams.....	"	Fell from ladder of car.....	Fatally injured.
3	Henry Rice.....	.....	Walking on track.....	Killed.
4	Wm. Brumbaugh.....	Brakeman	Poling car.....	Three ribs broken.
8	John Templeton.....	"	Coupling or pulling pin.....	Injured; arm crushed.
Feb. 1	F. P. Parke.....	"	Fell making coupling.....	Fatally injured.
5	H. A. Smith.....	"	Coupling.....	Two fingers taken off.
12	Kate Kennan.....	.....	Walking on track.....	Killed.
18	Pat Heathman.....	Switchman	Caught by bar of E. R. iron project'g over car	Injured; one finger off.

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881—Continued.

Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1881.				
Feb. 23	Thos. Dunn.....	Switchman.....	Coupling.....	Injured; hand shattered, etc.
Feb. 23	F. Hartshorn.....	Brakeman.....	Walking on track.....	Killed.
March 3	J. H. Walker.....	".....	Coupling.....	Injured; two fingers crushed.
16	C. Thompson.....	".....	".....	Injured; hand crushed.
17	Cyrus Zimmer.....	".....	Found dead on track.....	Killed.
24	M. Hildebrand.....	".....	Driving across track.....	"
29	Pat Carroll.....	Laborer.....	Fell from moving cars.....	"
30	Chas. Bailey.....	Brakeman.....	Jumped from fast moving train.....	"
April 2	{ Wm. Charles..... } { Dan'l Latham..... }	".....	Driving across track.....	Injured slightly.
29	Chas. Evans.....	Brakeman.....	Coupling.....	Injured; arm broken.
16	Geo. Raymond.....	Conductor.....	Jumping on track.....	" internally.
26	Geo. Carroll.....	Section man.....	On track intoxicated.....	Killed.
27	Dan'l Coghlin.....	Switchman.....	Coupling.....	Injured; hand crushed.
May 7	S. W. Erwin.....	Brakeman.....	Fell from cars.....	Killed.
23	John McNamara.....	".....	Coupling.....	Injured; thumb amputated.
23	Mrs. Santschie.....	".....	Walking on track.....	Killed.
June 1	Thos. Moore.....	".....	Stealing ride.....	"
1	John Farrell.....	".....	Walking on track.....	Injured; shoulder broken.
2	Mr. Hagenbaugh.....	".....	Got under cars in some unknown manner.....	Killed.
15	C. W. Sterns.....	Brakeman.....	Coupling.....	Injured; collar bone broken.
18	Dayton Collins.....	".....	Stepped on drawhead.....	foot burst open.
22	{ Thos. Garfield..... } { Mrs. Arnold..... }	".....	Drove on track ahead of engine.....	Killed.
27	Henry Hughes.....	".....	Walking on track.....	"

## SUMMARY OF ACCIDENTS.

Persons killed—causes.	Passengers.	Employees.	Others.	Total.
Getting on or off engine or train in motion.....		1	1	2
Run over in yards, on sidings, or in switching.....		2		2
Falling or thrown from engine or train.....		3		3
Struck by bridge, chute or other obstruction.....		1		1
Collisions, and standing on platform of car during same...		1		1
Riding or driving across track .....			3	3
Lying, walking, falling, or being on track.....		1	13	14
Totals.....		11	17	28

Persons injured—causes.	Passengers.	Employees.	Others.	Total.
Getting on or off engine or train in motion.....		2		2
Driving or riding across track.....			3	3
Coupling, or caught between cars and engine.....		18	1	19
Lying, walking, falling, or being on track.....			3	3
Run over in yards, on siding or switching.....		2		2
Miscellaneous .....		1		1
Totals.....		23	7	30

## RECAPITULATION.

Killed—Employees—from causes beyond their control.....	2
misconduct or want of caution .....	9
Others—at stations and highway crossings .....	3
stealing rides .....	2
trespassing on track, etc .....	12
Total killed .....	28
Injured—Employees—from causes beyond their control.....	7
misconduct or want of caution .....	16
Others—at stations and highway crossings.....	4
trespassing on track, etc.....	3
Total injured .....	30

## TRAIN ACCIDENTS—ENTIRE LINE.

*Return of accidents to trains occurring within the year ending June 30, 1881.*

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1880.				
July 20	Between Shinomy, Pa., and Transfer .....	Wild train .....	Collision .....	6 cars from trestle.
Aug. 3	Dayton, O .....	Freight .....	" .....	
7	Salamanca, N. Y. ....	Switching .....	Train broke in two .....	
9	Windham, O .....	Freight .....	" .....	
Sept. 23	Polk, O .....	" .....	5 cars off track by broken car .....	Engineer killed.
6	.....	" .....	Engine broke parallel rod .....	
8	Silver Creek, O .....	" .....	Brake came down .....	
Nov. 18	Urbana, O .....	" .....	Engine broke journal .....	
24	Near Hubbard, O .....	Construction .....	Collision .....	
31	Near Crawford, Pa .....	Passenger .....	Engine side rod broken .....	
Dec. 10	Near Mansfield, O .....	Freight .....	Collision .....	
1881.				
Jan. 19	Kent, O .....	Freight .....	Collision .....	
28	Cleveland, O .....	Switch train .....	Cars off end of notch .....	
Feb. 12	Betw'n Mill Village and Union, Pa .....	Freight .....	Collision .....	
March 16	Vienna Junction, O .....	.....	Cars ran out of switch .....	
April 18	Between Dennison and New Portage, O .....	Freight .....	Broken axle .....	
19	Solon, O .....	" .....	Track too wide .....	
May 18	Geauga Lake, O .....	" .....	Broken wheel .....	
June 7	Mantua, O .....	" .....	Collision .....	

*State of Ohio, county of Cuyahoga, ss.:*

John H. Devereux, President of the New York, Pennsylvania and Ohio Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

JOHN H. DEVEREUX,

[SEAL OF R. R.]

*President.*

Subscribed and sworn to before me, this 6th day of September, A. D. 1881.

J. T. WANN,

[SEAL.]

*Notary Public.*

## NORTH WESTERN OHIO RAILWAY COMPANY.

Name of road : North Western Ohio Railway.     e

By whom owned : North Western Ohio Railway Company.

By whom operated : Pennsylvania Company.

By what authority : Lease January 17, 1879.

Name of company making this report : North Western Ohio Railway Company.

General office at Pittsburgh, Pa., office of Pennsylvania Company, Lessee.

Principal office in Ohio at Toledo.

Address correspondence relating to this report to W. H. Barnes, Treasurer, at office of Pennsylvania Company, Pittsburgh, Pa.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Thomas D. Messler .....	President .....	Pittsburgh, Pa.....	.....
Frank Janes.....	Secretary .....	Toledo, O.....	.....
S. B. Liggett.....	Assistant Secretary.....	Pittsburgh, Pa.....	.....
W. H. Barnes .....	Treasurer.....	“ .....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Thos. D. Messler .....	Pittsburgh, Pa.	R. F. Smith .....	Cleveland, O.
J. N. McCullough.....	“	Geo. W. Layng.....	Toledo, O.
Wm. Thaw.....	“	Frank Janes .....	“
Jno. E. Davidson .....	“		

### CAPITAL STOCK.

#### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$2,600,000 00
Number of shares—common.....	52,000
Par value of each—common.....	\$50 00



## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common.....	2,600,000 00
Amount subscribed—common.....	2,000,000 00
Total paid in capital stock—common.....	2,000,000 00
Average amount paid in per mile of single main track (79 miles) .....	25,316 45
Proportion of same for Ohio, 79 miles.	

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For purchase of the road—Number shares, 40,000; amount of common, \$2,000,000.

Stockholders, residents of Ohio, 3.

Amount of stock held by them June 30, 1881, \$150.

Agent authorized to transfer stock: Assistant Secretary, Pittsburgh, Pa.

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$22,338 28	
Net unfunded debt .....		\$22,338 28
Average amount per mile of single main track.....	\$282 76	
Proportion of same for Ohio .....	All.	
Decrease since June 30, 1880.....	\$16,310 49	

## COST OF ROAD EQUIPMENT, ETC.

Total expenditures.....	\$1,980,997 50
-------------------------	----------------

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30TH.

Net income over operating expenses and rents paid .....	\$16,310 49
Percentage of same to capital stock and debt. ....	.008%

## OTHER PAYMENTS WITHIN THE YEAR.

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Floating debt liquidated .....	\$16,310 49
--------------------------------	-------------

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock.....	\$2,000,000 00	
Amount due Pennsylvania Co., lessee .....	22,338 28	
		<u>\$2,022,338 28</u>

## ASSETS.

Cost of road.....	\$1,980,997 50	
Cash.....	347 50	
		<hr/> \$1,981,345 00
Excess of liabilities.....		<hr/> \$40,993 28

*State of Pennsylvania, County of Allegheny, ss.:*

W. H. Barnes, Treasurer of the Northwestern Ohio Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

W. H. BARNES,

[SEAL OF R. R.]

*Treasurer.*

Subscribed and sworn to before me, this 30th day of August, A.D. 1881.

FRANK SEMPLE,

[SEAL]

*Notary Public.*

# PENNSYLVANIA COMPANY OPERATING NORTHWESTERN OHIO RAILWAY.

Name of road: Northwestern Ohio Railway.

By whom owned: Northwestern Ohio Railway Company.

By whom operated: Pennsylvania Company.

By what authority: Lease.

Name of company making this report: Pennsylvania Company operating Northwestern Ohio Railway Company.

General office at Pittsburgh, Pa.

Address correspondence relating to this report to J. P. Farley, Auditor, Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS OF PENNSYLVANIA COMPANY OPERATING.

Name.	Office.	Address.	Salary.
G. B. Roberts.....	President .....	Philadelphia, Pa.....	.....
J. N. McCullough .....	1st Vice President .....	Pittsburgh, ".....	.....
Wm. Thaw.....	2d ".....	" ".....	.....
Thos. D. Messler.....	3d Vice Pres. and Compt'r .....	" ".....	.....
John E. Davidson .....	Assistant Comptroller .....	" ".....	.....
S. B. Liggett.....	Secretary .....	" ".....	.....
S. N. White .....	Assistant Secretary.....	Philadelphia, ".....	.....
W. H. Barnes .....	Treasurer .....	Pittsburgh, ".....	.....
J. P. Farley .....	Auditor .....	" ".....	.....
D. W. Caldwell.....	General Manager.....	" ".....	.....
Wm. A. Baldwin .....	Manager.....	" ".....	.....
J. T. Brooks .....	General Counsel.....	" ".....	.....
F. Slataper .....	Chief Engineer.....	" ".....	.....
E. A. Ford .....	Gen. Pass'ger & Ticket Agt..	" ".....	.....
Wm. Stewart.....	General Freight Agent.....	" ".....	.....
J. N. McCullough.....	Executive Committee }	" ".....	.....
Wm. Thaw.....		" ".....	.....
Thos. D. Messler .....		" ".....	.....
Jno. P. Green .....		Philadelphia, Pa .....	.....
W. H. Barnes .....		Pittsburgh, Pa .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
George B. Roberts.....	Philadelphia, Pa	Henry M. Phillips .....	Philadelphia, Pa.
J. N. McCullough .....	Pittsburgh, Pa...	J. N. DuBarry .....	"
Wm. Thaw .....	" .....	J. P. Wetherill .....	"
Thos. D. Messler .....	" .....	A. J. Cassatt.....	"
Henry H. Houston.....	Philadelphia, Pa	John P. Green.....	"
Wistar Morris.....	" .....	W. H. Barnes.....	Pittsburgh, Pa.
Sam'l M. Felton.....	" .....		

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Toledo Junction to Toledo, O.....	79.983	79.983
Total single main track.....	79.983	79.983
Aggregate of sidings and other tracks.....	8.619	8.619
Total length laid with rail computed as single track.....	88.602	88.602
Laid with steel rail.....	11.76	11.76
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Richland .....	7.451	0.361	7.812
Crawford .....	12.759	0.412	13.171
Seneca .....	26.533	2.545	29.078
Sandusky .....	19.160	1.181	20.341
Ottawa .....	0.553	.....	0.553
Wood .....	9.548	0.957	10.505
Lucas .....	3.979	3.163	7.142
Totals .....	79.983	8.619	88.602
Steel rail .....	11.09	0.67	11.76

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft. 9 in.
Grade—Maximum, per mile .....	48 feet.
Longest maximum .....	1.38 miles.
Aggregate length of maximum .....	2.52 "
Curvature—Shortest radius, 5 degree curve.....	1,146.28 feet.
Aggregate length of shortest radius.....	848 "
Aggregate length of all radii.....	5.70 miles.
Aggregate length of tangent.....	74.22 "
Rail—Iron—On road.....	76.84 "
Average weight per yard .....	52 lbs.
Steel—On road .....	11.76 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile, main track, 2,816; side track .....	2,640
Number laid during the year.....	21,367
Ballasted—On whole line .....	75.98 miles.
In Ohio.....	75.98 "
With limestone and gravel.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 6; greatest age, 8 years; aggregate length, ft.....	696
Iron, 1; greatest age, 3 years; aggregate length, ft.....	1,100
Total .....	1,796
72	R.R.C.

Trestles—27; greatest age, 7 years; greatest height, 25 feet; greatest length, 1,336; aggregate length, 2,995.

Length of shortest span of truss,  $42\frac{1}{2}$  feet; of longest, 193; greatest length of beams between points of support, if not trussed, 14 ft.

Greatest space between cross ties upon bridges and trestles, 6 inches; length of ties, 9 ft. 6 inches.

Number of track-stringers, 2 if iron; 6 if wood.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Once a week by bridge foreman and semi-annually by inspectors.

Are the examinations analytical, and are they made by a competent person? Yes.

Fencing—Average and Aggregate Cost.	Whole Line.	In Ohio.
Number miles fencing computed as single line.....	150.4 miles.	150.4 miles.
Kind of fencing, as follows:		
Post and board (average cost per rod, 70 cents)...	110.4	110.4
Rail (average cost per rod, 90 cents).....	40	40
Cost of fencing.....	\$33,689 60	\$33,689 60
Average cost of same per rod.....	70 cts.	70 cts.
Length of road unfenced, and the reason therefor:		
Through towns, etc.....	9.566 miles.	9.566 miles.

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Cleveland, Columbus, Cincinnati & I. R'y at Vernon.

Baltimore & Ohio R. R. at Tiffin.

Cincinnati, Sandusky & C. R'y at Tiffin.

Lake Erie & Western R'y at Burgoon.

Lake Shore & M. S. R'y at East Toledo.

What railroads cross your road either over or under your grade in this State, and where?

Lake Shore & M. S. R'y at East Toledo.

Dayton & Michigan R. R. at East Toledo.

Number of crossings of highways at grade in this State without protection, 99.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 1.

Number of crossings of highways over railroad, 2.  
under railroad, 1.

Number of highway bridges 18 feet above track, 2.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated .....	86.4; in Ohio.....	86.4
Miles of same owned by railroad company.....	86.4; " .....	86.4

## STATIONS.

Passenger and freight .....	18; in Ohio.....	18
Number with telegraph communication.....	10; " .....	10
Number of same operated by railroad company .....	10; " .....	10

Is pay received for messages sent over line owned by railroad company? Yes.

## ROLLING STOCK.

Locomotives .....	10; average weight—lbs.....	59,000 00
Express and baggage cars.....	3; " .....	29,000 00
Passenger cars .....	6; " .....	41,000 00
Freight cars (other companies' cars used as business demands).....		19,000 00

Above includes not owned by company reporting.

Locomotives, 10; owned by P., Ft. W. & C. R'y.

Express and baggage cars, 3; owned by P., Ft. W. & C. R'y.

Passenger cars, 6; owned by P., Ft. W. & C. R'y.

Freight cars, foreign companies cars used.

Terms of service:

Engine, 6 per cent. per annum on valuation and current repairs.

Freight cars,  $\frac{3}{4}$  cent per mile.

Passenger cars,  $2\frac{1}{2}$  cents per mile.

Baggage cars,  $1\frac{1}{2}$  cents per mile.

Number of locomotives equipped with train brakes, 5.

Kind of brake: Westinghouse Air Brake.

Number of cars equipped with train brakes, 9.

Kind: Westinghouse Air Brake.

Number of passenger cars with "Miller Platform": None.

Method of bridging between passenger cars, when two or more are run in trains: Janney's patent platform and coupler.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Spear's patent anthracite coal burner.

Means of lighting same: Oil and candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	23 miles per hour.
Mail and accommodation .....	20 "
Freight trains .....	15 "

## EMPLOYES.

Superintendent.....	1
Telegraph operators .....	27
Engineers.....	13
Baggagemen .....	4
Flagmen, switch-tenders and watchmen .....	18
Laborers .....	227

Clerks .....	37
Train dispatchers .....	4
Firemen .....	13
Mechanics .....	24
Conductors .....	22
Brakemen .....	41
Station agents .....	19
Section men .....	20
Other employes .....	10

Total number employed by company in operating line..... 480

Proportion for Ohio.. .. 480

#### EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American Express Co.

Terms: \$30.00 per day.

Special freight and transportation lines: None except Union Line, owned by Pennsylvania Company.

#### AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives.....	{ Passenger.....	16	Joint Fastenings.....		12
	{ Freight.....	15	Frogs.....		1
Cars.....	{ Passenger.....	12	Ties—Oak.....		6
	{ Baggage.....	12	Bridges.....	{ Wooden.....	9
	{ Box.....	10		{ Iron.....	24
	{ Stock.....	10		{ Trestles.....	6
	{ Coal.....	8		{ Piling.....	6
Rails—Steel.....	{ Flat.....	8	Telegraph poles—Cedar.....		12
		9	Fence posts.....		8

#### RATES OF TRANSPORTATION.

##### PASSENGERS.

Fare charged per mile—

	Highest.	Lowest.	Average.
For distances less than 8 miles.....	4 Cts.	3 Cts.	3½ Cts.
For distances over 8 miles—1st class.....	3	2	2½
2d class.....	2	1	1½
Emigrant.....	2	1	1½
Excursion.....	2	1	1½
Minimum rate, 10 cents.			

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class.....	024 Cts.	.00267 Cts.	.0052 Cts.
Second class.....	024	.00233	
Third class.....	024	.00198	
Fourth class.....	024	.00174	
Fifth class.....	010	.00145	

Rate per ton per mile on freight carried less than 30 miles :

First class.....	48	.0517	.01039
Second class.....	48	.0517	
Third class.....	48	.0483	
Fourth class.....	40	.0448	
Fifth class .....	32	.0414	

Rate per ton per mile on freight carried more than 30 miles :

First class.....	05	.0535	.01039
Second class.....	05	.0465	
Third class.....	0469	.0395	
Fourth class .....	0433	.0349	
Fifth class .....	0366	.0291	

Rate per ton per mile for—

Coal—Carried ten miles or more.....	05	.0209	.01039
Carried less than ten miles.....	18	.0555	
Pig iron—Carried ten miles or more.....	05	.0291	
Carried less than ten miles .....	20	.0555	
Limestone—Carried ten miles or more.....	05	.0209	
Carried less than ten miles.....	18	.0555	
Iron ore—Carried ten miles or more.....	05	.0209	
Carried less than ten miles.....	18	.0555	
Undres'd stone or lumber—Carried 10 miles or more.	05	.0291	
Carried less than 10 mi..	20	.0555	

Rate per 100 lbs. for loading : No charge made for loading.

Rate per 100 lbs. for unloading : No charge made for unloading.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows—Location or how designated, Maumee river ; construction, pin connected, through ; material, iron ; length, 197 ft. 2 inches.

Trestles—Length filled and converted into embankment, 45 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, 70c.)  $1\frac{4}{5}$ .Ballasting—Miles of main track ballasted, with limestone,  $2\frac{3}{4}$ .Rail laid—Steel, 60 lbs. per yard—miles of track,  $4\frac{8}{10}$ .

Train mileage—Passenger.....	121,722
Freight .....	245,000
Construction .....	10,962

Total .....

377,684



Car mileage—Passenger.....	224,759
Express and baggage.....	122,264
Freight—loaded.....	1,632,097
empty.....	353,831
Caboose .....	113,358
Total .....	2,446,309
Fuel consumed—Wood, 324 cords; coal, 5,745 tons. Total cost .....	\$14,895 00
Losses, etc., paid—On goods and baggage .....	260 55
For injuries in Ohio, fatal and non-fatal, to employes .....	24 00
For animals killed in Ohio—Cattle .....	30 00
Amount claimed in litigation, etc., for injuries in Ohio to persons .....	10,000 00

## TRANSPORTATION.

Passengers—Number carried, local .....	105,271
Average number carried in each car per trip.....	10.9
Average number of miles traveled by each.....	23.4
Total mileage, or number carried one mile .....	2,470,693
Average amount received for each.....	60.8 cents.
Average amount <i>per mile</i> received for each .....	2.5 “
Freight—Tons carried, local.....	168,073
through .....	79,463
Total .....	247,536
Average tons in each loaded car per trip.....	10.3
Average tons in each loaded car per mile.....	10.3
Total movement, or tons carried one mile.....	16,910,545
Average amount received for each ton.....	71.017 cents.
Average amount <i>per mile</i> received for each ton.....	01.039 “
Average cost per ton freight per mile.....	$\frac{844}{1000}$ “
Average amount received for each ton through freight.....	51.99 “
Average amount received for each ton local freight.....	80 “

Articles transported :	Tons.	Per cent.
Coal .....	20,888	08.74
Coke.....	12,885	05.21
Stone, lime, sand, etc.....	14,771	05.96
Petroleum .....	561	00.26
Pig and bloom iron.....	2,508	01.01
Manufactured iron .....	6,281	02.54
Lumber and other forest products. ....	57,315	23.15
Grain, flour, and other agricultural products.....	82,452	33.31
Live stock.....	4,228	01.70
Animal products .....	1,989	00.80
Manufactures, including agricultural implements ...	34,651	13.99
Merchandise .....	8,723	03.52
Miscellaneous .....	284	00.11

Total tonnage yielding revenue .....	247,536	100.
Supplies for company's use.....	12,593	



ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
	1880.				
1	Aug. 2	Chas. Gunther	Brakeman...	In act of uncoupling, fell between cars .....	Killed instantly.
2	Oct. 26	Linc'n Burgett	" .....	Assisting in turning engine on turntable; engine took steam, and run off end of turntable .....	
3	Dec. 5	A. D. Dickson..	Farmer .....	Accident occurred at the public crossing, 1½ miles west of DeKalb. Horse frightened and ran off, running toward freight train just then passing the crossing, throwing Mr. Dickson against one of the cars.....	Severely straining the ligaments of foot and ankle.  Died in about two hours.

SUMMARY OF ACCIDENTS.

PERSONS KILLED—CAUSES.

Employees—Run over in yards, on sidings, or in switching.....	1
Others—Riding or driving across track.....	1
Total.....	2

PERSONS INJURED—CAUSES.

Employees—Miscellaneous .....	1
-------------------------------	---

RECAPITULATION.

Killed—Employees—misconduct or want of caution .....	1
Others—at stations and highway crossings .....	1
Total killed.....	2
Injured—Employees—misconduct or want of caution .....	1

State of Pennsylvania, County of Allegheny, ss.:

Thomas D. Messler, Third Vice President of the Pennsylvania Company, operating the Northwestern Ohio Railway, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

THOS. D. MESSLER,  
Third Vice President.

Subscribed and sworn to before me this 9th day of September, A. D. 1881.

[SEAL.]

FRANK SEMPLE,  
Notary Public.

## OHIO CENTRAL RAILROAD COMPANY.

[From November 1, 1880, to June 30, 1881.]

Name of road: Ohio Central Railroad.

By whom owned: Ohio Central Railroad Company.

By whom operated: Ohio Central Railroad Company.

Name of company making this report: Ohio Central Railroad Company.

General office at Toledo, O.

Principal office in Ohio at Toledo, O.

Address correspondence relating to this report to W. H. Andrews, Auditor, at Toledo, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

This railroad was first known as the Atlantic and Lake Erie Railway, and was incorporated as such in 1869. Under this name a large amount of work on substructure was done between its termini, Toledo and Pomeroy, and several miles of track laid between New Lexington and Moxahala, in Perry county.

In 1876, the corporate name was changed to the Ohio Central Railway without a change of organization, and, under this name, track was laid from Bremen, in Fairfield county, to the P., C. and St. L. Railway, near Newark, in Licking county. In 1877 it was put into the hands of a Receiver, and was sold at judicial sale in March, 1878, to a trustee representing the principal creditors.

In November following, that portion of the road between Bush's Station, in Fairfield county, and Corning, in Perry county, was sold to an association of persons that extended the line from Bush's to Columbus, and was incorporated as the Columbus and Sunday Creek Valley Railroad Company. In 1880, the remainder of the line of road was sold to the present organization, which was incorporated under the name of the Ohio Central Railroad Company, and consolidated with the Columbus and Sunday Creek Valley Railroad Company, with a capital stock of \$4,000,000, afterwards increased to \$4,500,000. The whole road, as now operated, was opened Nov. 1, 1880.

In January, 1881, the company purchased the stock of the Ohio Central Coal Company, and, for this purpose, increased its capital stock from \$4,500,000 to \$12,000,000.

This company also uses, under lease from the P., C. and St. Louis Railway Company, that portion of the Muskingum Valley Division between Bremen and New Lexington, and that part of the Central Ohio Division between Alum Creek, aggregating 15.9 miles of leased road

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary
Dan'l P. Eells.....	President.....	Cleveland, Ohio.....	
Samuel Thomas.....	Vice President.....	Columbus, ".....	
B. G. Mitchell.....	Secretary.....	New York City.....	
B. G. Mitchell.....	Treasurer.....	".....	
W. H. Andrews.....	Auditor and cashier.....	Toledo, Ohio.....	
G. G. Hadley.....	General Manager.....	".....	
W. H. Vandergrift.....	Superintendent.....	".....	
C. Buxton.....	Chief Engineer.....	".....	
Hudson Fitch.....	General Freight Agent.....		
Hudson Fitch.....	General Ticket Agent.....		
Dan'l P. Eells.....	Executive Committee..	Cleveland, Ohio.....	
Samuel Thomas.....		Columbus, ".....	
C. S. Brice.....		Lima, ".....	
George I. Seney.....		New York City.....	

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Dan'l P. Eells.....	Cleveland, O.....	Chas. Foster.....	Columbus, O.
Samuel Thomas.....	Columbus, O.....	C. R. Cummings.....	Chicago, Ill.
C. S. Brice.....	Lima, O.....	Geo. F. Stone.....	New York City.
Wm. H. Harris.....	Cleveland.....		
Geo. I. Seney.....	New York City..		
Walston H. Brown.....	".....		

## CAPITAL STOCK.

Capital stock authorized by law—

Amount—common.....	\$12,000,000 00
Number of shares—common.....	120,000 00
Par value of each—common.....	100 00
Capital stock authorized by vote of company—common.....	12,000,000 00
Amount subscribed—common.....	12,000,000 00
Total paid in capital stock—common.....	12,000,000 00

Capital stock issued, and on what account, as follows:

On what account.	No. shares.	Amount of common.
For subscriptions paid in cash.....	1,000	\$100,000
For original construction.....	40,000	4,000,000
For construction on extension of line or branches.....	4,000	400,000
For purchase of Ohio Central Coal Company's stock. ....	75,000	7,500,000
Total.....	120,000	\$12,000,000

Stockholders, residents of Ohio, 10.

Amount of stock held by them June 30, 1881, \$49,600.

Agents authorized to transfer stock: Metropolitan National Bank, New York City.

Number of shares transferred within the year at such agencies, 226,450.

### FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mort. bonds.....	Mortgage .....	Jan. 1, 1880	Jan. 1, 1920	6	\$3,000,000 00	\$3,000,000 00
Mineral div. bonds.....	" .....	1, 1881	1, 1921	6	300,000 00	300,000 00
Income bonds.....	" .....	1, 1880	1, 1920	7	3,000,000 00	3,000,000 00
Mineral div. bonds.....	" .....	1, 1881	1, 1921	7	300,000 00	300,000 00
Toledo terminal 1st mortgage bonds..	" .....	Aug. 2, 1880	July 1, 1920	6	600,000 00	600,000 00
Car trust cert. No. 1..	" .....	Sept. 1, 1880	\$20,000 Sept. 1, 1881; \$20,000 semi-annually.....	8	400,000 00	400,000 00
Car trust cert. No. 2..	" .....				800,000 00	800,000 00
Total.....						\$8,040,000 00

\*Assessments paid.

Average amount per mile of single main track (217.4 miles)..... \$36,982

Proportion of same for Ohio, all.

### OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$305,846 89	
All other debts, current credit balances, etc.....	84,029 63	
Total unfunded debt.....	389,876 52	
Cash securities, debit balances, etc., available to payment..	83,834 24	
Net unfunded debt.....		\$306,042 28
Average amount per mile of single main track (217.4 miles)..	\$1,407 00	
Proportion of same for Ohio, all.		
Total net debt liabilities.....		8,346,042 28
Average amount per mile of single main track (217.4 miles)..	\$38,390 00	
Proportion of same for Ohio, all.		
Total of paid in stock and debt, including stock issued for O. C. C. Co.'s stock.....		20,346,042 28
Total average amount per mile, exclusive of \$750,000 stock for purchase of O. C. C. Co.'s stock.....	\$59,089 00	
Total average amount per mile, inclusive of \$750,000 stock for purchase of O. C. C. Co.'s stock.....	93,588 00	

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures for the year ending June 30th, 1881.
Right of way.....	\$21,228 89
Civil engineering.....	1,158 05
Grading and masonry.....	18,926 73
Bridges.....	7,232 16
Timber and ties .....	4,050 26
Superstructure.....	6,774 69
Fencing .....	9,367 75
Passenger and freight stations.....	26,208 15
Engine and car houses.....	448 92
Machine shops, machinery and fixtures.....	72,684 22
Other buildings and fixtures.....	5,762 79
Telegraph .....	1,768 87
Steel rails.....	25,852 48
Interest and discount—miscellaneous.....	342,143 46
Terminal facilities at Toledo.....	349,804 74
Ballasting.....	41,206 32
Splices, spikes and bolts.....	4,197 19
Frogs and switches.....	5,156 73
Total expenditures for construction.....	\$943,972 40

## ROAD ACQUIRED BY PURCHASE.

Columbus & Sunday Creek Valley R. R.—purchased for.....	\$3,000,000 00
Construction of Ohio Central R. R., in addition to above.....	7,440,000 00
Subsequent expenditures for construction.....	943,972 40
Total expended for construction and purchase .....	\$11,383,972 40
Average cost per mile of road constructed(single main track, 217.4 mi.)	52,364 00
Average cost per mi. of road owned by Co.(single main track, 217.4 mi.)	52,364 00
Proportion of same for Ohio.....	All.

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 30.....	\$247,500 00
First class passenger cars, 8.....	40,000 00
Second class passenger cars, 4.....	10,000 00
Box freight cars, 158.....	79,000 00
Platform cars, 64.....	22,400 00
Baggage cars, 3.....	8,100 00
Mail and express cars, 3 .....	9,000 00
Coal cars, 2,614.....	1,038,151 93
Stock cars, 10.....	4,750 00
Caboose cars, 16.....	9,600 00
Wrecking cars, 2.....	3,000 00
Total cost of railroad equipment owned by company.....	1,471,501 93

Average amount per mile (of single main track, 217.4 miles). .....	6,768 00
Proportion for Ohio, all.....	12,855,474 33
Total for road and equipment.....	59,132 00
Total average amount per mile (of single main track, 217.4 miles).	
Proportion for Ohio, all.	

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Corning to Buckingham, 20 miles.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Toledo, Ohio, to Bremen, Ohio.....	160.6	All.
New Lexington, Ohio, to Corning, Ohio.....	12.4	"
Alum Creek, Ohio, to Bush's, Ohio.....	24.4	"
Total single main track .....	197.4	"
Aggregate of sidings and other tracks .....	16.9	"
Total length laid with rail computed as single track.....	214.3	
Laid with steel rail .....	150	

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Lucas .....	2.4	.4	2.8
Wood .....	31.4	.7	32.1
Seneca .....	15.9	.9	16.8
Wyandot.....	9.2	.2	9.4
Crawford.....	18.2	1.9	20.1
Marion.....	4.2	.2	4.4
Morrow .....	22.2	1.1	23.3
Delaware.....	1.7	.1	1.8
Knox .....	4.8	.4	5.2
Licking.....	31.6	1.4	33.
Fairfield .....	33.9	2.6	36.5
Perry.....	12.4	6.2	18.6
Franklin.....	9.5	.8	10.3
Total .....	197.4	16.9	214.3
Steel rail .....			150

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
P., C. & St. L. R'y, Columbus, Ohio, to Alum Creek, Ohio .....	41.3	All.
C. & M. V. R'y, Bremen to New Lexington, Ohio.....	11.6	"
Total single track.....	15.9	



## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4 feet 8½ in.
Grade—Maximum, per mile .....	66 feet.
Longest maximum .....	21,120 "
Aggregate length of maximum.....	42,768 "
Curvature—Shortest radius .....	955 "
Rail—Iron—On road.....	474 miles.
Average weight per yard.....	56 lbs.
Steel—On road .....	150 miles.
Average weight per yard .....	53 lbs.
Ties—Average number per mile.....	2,600
Number laid during the year.....	400,000
Ballasted—On whole line .....	125 miles.
In Ohio .....	All.
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 18; greatest age, 1½ years; aggregate length, 1,945 feet.
Trestles—Length of shortest span of truss, 55 feet; of longest, 150 feet; greatest length of beams between points of support, if not trussed, 14 feet, 6 in.
Greatest space between cross ties upon bridges and trestles, 20 inches; length of ties, 9 feet.
Number of track stringers, 2.
Are all bridges and trestles provided with guard rails? Yes.
Do all bridges and trestles receive stated examinations? Yes.
How often? Monthly.
Are the examinations analytical, and are they made by a competent person? Yes.
Tunnels—stone, 1; length, 660 feet.
wood, 1; " 1594 feet; total, 2254 feet.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole line.	In Ohio.
Number miles fencing, computed as single line.....	100	All.
Kind of fencing, as follows:		
Wire (average cost per rod, \$ .75.)		
Average cost of same per rod, 75 cents.		
Length of road unfenced, and the reason therefor: Road is being fenced as fast as can be built.		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Lake Erie and Western Railway at Fostoria, O.

Columbus and Toledo Railroad at Fostoria, O.

Baltimore and Ohio Railroad at Fostoria, O.

Cincinnati, Sandusky and Cleveland Railroad at Berwick, O.  
 Pittsburgh, Ft. Wayne and Chicago Railway at Bucyrus, O.  
 New York, Pennsylvania and Ohio Railway at Locust, O.  
 C. C. C. & I. Railway, Indiana Division at Locust, O.  
 C. C. C. & I. Railway, Columbus Division at Levering, O.  
 Mt. Gilead Short Line Railway at Mt. Gilead O.  
 Cleveland, Mt. Vernon and Columbus Railroad at Centerburg, O.  
 Pittsburgh, Cincinnati and St. Louis Railway near Granville, O.  
 What railroads cross your road either over or under your grade in this State, and where?  
 Lake Shore and Michigan Southern Railway at Toledo, O.  
 Dayton and Michigan Railway at Toledo, Ohio.  
 Number of crossings of highways at grade in this State without protection, 300.  
 Number of crossings of highways over railroad, 2.  
 " " " under railroad, 10.  
 " Highway bridges 18 feet above track, 2.  
 Do all trains stop at R. R. crossings as required by law? Yes.  
 Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated, 213.3.  
 Miles of same owned by railroad company, none.

## STATIONS.

Passenger and freight, 53.  
 Number with telegraph communication, 32.  
 Number of same operated by railroad company, 53.

## ROLLING STOCK.

Locomotives.....	30; average weight.....	10,000 pounds.
Express and baggage cars .....	6; " .....	28,000 "
Passenger cars.....	12; " .....	40,000 "
Freight cars .....	2648; " .....	18,000 "
Other cars.....	18; " .....	20,000 "

Number of locomotives equipped with train brakes, 9.  
 Kind of brake: Westinghouse Automatic Air Brake.  
 Number of cars equipped with train brakes, 14.  
 Number of passenger cars with " Miller Platform," 12.  
 Method of bridging between passenger cars, when two or more are run in trains:  
 " Miller Platform."  
 Are all cars run on this road heated and lighted as prescribed by law? Yes.  
 State methods of heating cars used for the transportation of passengers: Baker heater and Spears stoves.  
 Means of lighting same: Oil lamps and coach candles.

SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation,                   “                   .....	25                   “
Freight trains,                                   “                   .....	12                   “

## EMPLOYES.

Superintendents.....	1
Telegraph operators .....	22
Engineers.....	41
Baggagemen .....	4
Flagmen, switch-tenders and watchmen .....	26
Laborers.....	20
Clerks .....	24
Train dispatchers.....	3
Firemen .....	41
Wipers .....	16
Mechanics.....	72
Conductors .....	20
Brakemen .....	40
Station agents .....	37
Section men.....	214
Other employes .....	18

Total number employed by company in operating line..... 600

Proportion for Ohio.....	600
--------------------------	-----

EXPRESS AND TRANSPORTATION COMPANIES:

Express companies run on this road: United States, Adams and Union.

Terms: An agreed rate per 100 pounds, averaging about 25 cents.

### RATES OF TRANSPORTATION.

PASSENGERS.

Fare charged per mile—	Highest.	Lowest.	Average.
For distances less than 8 miles .....	10 Cts.	3 Cts.	} 2.69 Cts.
For distances over 8 miles—1st class.....	3	2	
excursion .....	2	1	

FREIGHT.

Rate per 100 lbs. per mill when freight weighs less than a ton:

First class .....	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
Second class .....	$\frac{1}{4}$	$\frac{1}{7}$	$\frac{9}{30}$
Third class.....	$\frac{1}{4}$	$\frac{1}{7}$	$\frac{1}{4}$
Fourth class.....	$\frac{1}{4}$	$\frac{1}{9}$	$\frac{1}{6}$
Fifth class .....	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{8}$
Special class.....	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$

## Rate per ton per mile on freight carried less than 30 miles:

First class.....	5	5	5
Second class.....	5	5	5
Third class.....	5	5	5
Fourth class.....	5	5	5
Fifth class.....	4	4	4

## Rate per ton per mile on freight carried more than 30 miles:

First class.....	5	5	5
Second class.....	5	3.3	4½
Third class.....	5	2.8	4
Fourth class.....	5	2.3	3½
Fifth class.....	4	1.3	2½
Special class.....	3.7	1.3	2.3

## Rate per ton per mile for—

Coal—Carried ten miles or more.....	3.4	1.3	2.2
Carried less than ten miles.....	5	5	5
Pig iron—Carried 10 miles or more.....	3.4	1.3	2.2
Carried less than 10 miles.....	5	5	5
Limestone—Carried 10 miles or more.....	3.4	1.3	2.2
Carried less than 10 miles.....	5	5	5
Iron ore—Carried 10 miles or more.....	3.4	1.3	2.2
Carried less than 10 miles.....	5	5	5
Undressed stone or lumber—Carried 10 miles or more....	3.7	1.3	2.3
Carried less than 10 miles....	5	5	5

## DOINGS OF THE YEAR ENDING JUNE 30TH.

## Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length.
Toledo.....	Howe truss.....	Wood.....	100 feet.
Toledo.....	".....	".....	125 "
Pemberville.....	".....	".....	150 "
Pemberville.....	".....	".....	100 "
McCutchensville.....	".....	".....	150 "
Broken Sword.....	".....	".....	100 "
Bucyrus.....	".....	".....	150 "
New Winchester.....	".....	".....	76 "
Locust.....	".....	".....	100 "
Mt. Gilead.....	".....	".....	100 "
Alum Creek.....	".....	".....	100 "
Marengo.....	".....	".....	60 "
Granville.....	".....	".....	150 "
Millersport.....	".....	".....	110 "

Train mileage—Passenger .....	133,180	
Freight .....	201,234	
Construction .....	25,868	
Total.....		360,282
Car mileage—Passenger .....	237,517	
Express and baggage.....	129,638	
Freight—loaded .....	2,510,339	
empty.....	1,931,555	
Caboose.....	201,271	
Construction and other.....	564,731	
Total.....		5,575,051
Fuel consumed—Wood, 225 cords; coal, 15,001 tons; total cost.....		\$17,982 54
Losses, etc., paid—On goods and baggage .....		98 30
For injuries in Ohio, fatal and non-fatal:		
to employees.....		681 85
For animals killed in Ohio:		
Cattle, 3.....	\$49 50	
Sheep, 15.....	50 00	
Total.....		\$99 50

## TRANSPORTATION.

Passengers—Number carried, local.....	66,629
Average number carried in each car per trip .....	5.6
Average number of miles traveled by each .....	19.84
Total mileage, or number carried one mile .....	1,321,961
Average amount received for each.....	53.38c.
Average amount <i>per mile</i> received for each .....	2.69c.
Freight—Tons carried—local .....	247,732
Average tons in each loaded car per trip.....	11.11
“       “       “       mile .....	11.57
Total movement, or tons carried one mile .....	29,044,685
Average amount received for each ton .....	\$1 09.97
“       amount <i>per mile</i> received for each ton .....	.938c.
“       cost per ton freight per mile.....	.623c.
“       amount received for each ton local freight.....	\$1 09.97
“       cost each ton local freight .....	73.103c.

Articles transported:	Tons.	Per cent.
Coal.....	189,553	76.52
Stone, lime, sand, etc.....	3,136	1.26
Petroleum .....	218	.09
Ores.....	296	.12
Pig and bloom iron.....	2,573	1.04
Manufactured iron .....	1,357	0.54

## OHIO CENTRAL RAILROAD.

1155

Lumber and other forest products.....	28,430	11.48
Grain, flour, and other agricultural products .....	10,883	4.40
Live stock .....	665	0.26
Animal products .....	108	.04
Manufactures, including agricultural implements .....	3,117	1.26
Merchandise .....	3,336	1.35
Miscellaneous.....	4,060	1.64
		<hr/>
Total tonnage yielding revenue .....	247,732	100.
Supplies for company's use .....	29,476	

EARNINGS, OPERATING EXPENSES, ETC., FOR EIGHT MONTHS ENDING  
JUNE 30TH.

## EARNINGS.

Passenger transportation—local.....	\$35,566	33
Freight transportation—local .....	272,430	47
Mail service.....	4,867	76
Express service.....	1,162	22
Other sources.....	22,115	83
		<hr/>
Total earnings of line operated included in this report.....	\$336,142	61

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$36,668	16
Maintenance of cars .....	19,596	46
Motive power.....	8,963	65
Conducting transportation.....	120,957	30
General expenses:		
• Taxes in Ohio .....	2,170	96
Salaries.....	16,076	39
Other general expenses of operating .....	5,310	61
		<hr/>
Total operating expenses, being 62.4 per cent. of earnings .....	\$209,743	53
		<hr/>
Net earnings of 213.3 miles operated.....	\$126,399	08
Rentals paid for use of road, track, depots, equipment, etc.....	9,263	45
Net income over operating expenses and rents paid .....	117,135	63
Percentage of same to capital stock and debt, exclusive of that issued for O. C. C. Co.'s stock .....		.091
Percentage of to total means applied to construction, etc.....		.091
Per mile of earnings . . . . . \$1,575 00; proportion for Ohio (213.3 mi.)..	\$336,142	61
operating expenses..... 983 00;      “      “      “      ..	209,743	53
net earnings..... 592 00;      “      “      “      ..	126,399	08

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock.....	\$12,000,000 00	
Sale of bonds of company.....	8,040,000 00	
Sale of real estate, donation for Bucyrus shops.....	50,000 00	
Increase of floating debt .....	306,042 28	
	<hr/>	\$20,396,042 28

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$117,000 00	
Construction of new work.....	943,072 40	
Additional equipment .....	1,471,501 93	
Ohio Central coal stock investment.....	7,500,000 00	
Purchase of road .....	10,440,000 00	
	<hr/>	\$20,472,474 33

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$12,000,000 00	
First mortgage bonds.....	3,300,000 00	
Toledo terminal bonds.....	600,000 00	
Car trust certificates, No. 1.....	400,000 00	
“ “ No. 2.....	440,000 00	
Income bonds.....	3,300,000 00	
Temporary loan .....	305,846 89	
Accrued interest .....	10,666 64	
Sundry accounts payable .....	73,362 99	
Income account .....	39,468 99	
	<hr/>	\$20,469,345 51

## ASSETS.

Cost of road.....	\$11,383,972 40	
Equipment.....	1,471,501 93	
Investment in Ohio Central Coal Co.'s stock .....	7,500,000 00	
Due from agents .....	29,524 46	
“ connecting roads.....	17,041 68	
“ accounts receivable and individuals.....	3,986 34	
Sundry other accounts.....	6,541 79	
Supplies on hand.....	30,036 94	
Cash on hand .....	26,739 97	
	<hr/>	\$20,469,345 51

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	Jan. 13	John Monahan.....	Passenger...	Fell off of car .....	Ankle crushed.
2	28	Michael Donahoe	Switchman..	Foot caught in guard rail .....	Foot crushed—amputated.
3	Feb. 24	S. H. Turner .....	Brakeman ..	Coupling cars .....	3 fingers mashed.
4	Mar. 15	G. R. Gorham.....	Engineer ..	F'ght train from track	Head, arm and back injured.
5	15	Jac. Schwartzkoff..	Fireman.....	" "	Scalded.
6	15	Geo. " "	Brakeman ..	" "	Killed.
7	June 12	C. A. Vansickle ...	" ..	Coupling .....	Finger mashed.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Engine or train leaving or thrown from track .....	1
Total .....	1

## PERSONS INJURED—CAUSES.

Passengers—Falling between cars .....	1
Employees—Coupling, or caught between cars and engine.....	2
Engine or train leaving or thrown from track.....	1
Broken axles and exploded or capsized engine.....	2
Total .....	6

## RECAPITULATION.

Killed—Employees—from causes beyond their control.....	1
Total killed .....	1
Injured—Passengers—from misconduct or want of caution.....	1
Employees—from causes beyond their control .....	3
misconduct or want of caution .....	2
Total injured.....	6



## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of Accident.
1	Jan. 10	N'r McCutchensv	Freight.....	Unknown .....	Caboose jumped track.
2	Feb. 9	" Pleasantville	Passenger.....	Washout.....	Engine tender went in creek.
3	24	" Stony Ridge..	Freight.....	Brake beam fell down...	Two flat cars derailed.
4	Mch. 3	" Pemberville..	Two freights.....	Collision.....	Two engines disabled and eleven cars damaged.
5	6	" Johnstown...	Frt. & light eng..	" .....	Engine tender slightly damaged.
6	12	" Sycamore.....	Freight.....	Track out of line.....	Six cars derailed.
7	15	" Fostoria.....	" .....	Expansion of rails.....	Engine and seven cars derailed; one man killed, two injured.
8	21	" Moxahala.....	Frt. & const'n ...	Collision .....	Engine pilot damaged.
9	25	" Granville.....	Two freights.....	" .....	Two engine pilots and several draw bars broken.
10	26	" Lemert.....	Freight .....	Broken axle .....	4 cars slightly damaged.
11	29	" Hebron .....	Frt. & const'n ...	Collision .....	Engine pilot and two draw bars broken.
12	Apr. 6	" Sycamore .....	Freight .....	Car broke down .....	Slight damaged.
13	23	" Berwick.....	" .....	Track out of line .....	Five cars wrecked.
14	May 7	" Bucyrus.....	Passenger.....	Bad crossing.....	Eng. off track; no damage.
15	8	" Marengo .....	Freight .....	Broken wheel.....	One broken wheel.
16	28	" Ray City.....	Construction ..	" .....	" .....
17	June 1	" McCutchensv	Frt. & const'n ...	Collision.....	Two engines and six cars wrecked.
18	2	" Pleasantville	Two freights.....	" .....	Two engines disabled and several draw bars broken.
19	25	" Stony Ridge..	Freight .....	Track out of line .....	Two cars wrecked.
20	25	Locust .....	Frt. & passenger	Collision .....	Caboose thrown from track.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	9
Accidents not resulting in derailment of train.....	3
Collisions—butting .....	5
crossing .....	1
rear .....	2
Total accidents .....	20

## Causes of accidents effecting derailment of trains:

Broken axle.....	1
Track out of line.....	3
Rails expanded.....	1
Bad crossing .....	1
Washout .....	1
Unexplained .....	1
Other causes.....	1
Total.....	9

## Causes of collisions:

Failure of brakes.....	1
Orders—absence of, mistake in, neglect or disobedience to.....	3
Runaway engine .....	3
Signals—failure to use, or absence of.....	1
Total .....	8

## Causes of accidents not resulting in derailment of trains :

Other causes—broken wheel, 2; broken car, 1; total.....	3
Total derailments.....	9
Total collisions .....	8
Total accidents .....	20

*State of Ohio, County of Lucas, ss. :*

G. G. Hadley, General Manager of the Ohio Central Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

G. G. HADLEY,

*General Manager.*

Subscribed and sworn to before me, this 7th day of September, A. D. 1881.

[SEAL.]

SYLVESTER LAMB,

*Notary Public, Lucas county, O.*

## OHIO AND MISSISSIPPI RAILWAY COMPANY.

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Name of road: Ohio and Mississippi Railway.

By whom operated: John King, Jr., Receiver.

By what authority: Order of court.

Name of Receiver making this report: John King, Jr., Receiver of Ohio and Mississippi Railway Company.

General office at Cincinnati, Ohio.

Principal office in Ohio at Cincinnati, Ohio.

Address correspondence relating to this report to C. A. Beecher, at Cincinnati, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The original charter of the Ohio and Mississippi Railway Company in Ohio was passed March 15, 1849. An amendment to this charter, defining intentions of original charter and extending its powers, was passed Jan. 24, 1851. This company was foreclosed by decree of the Circuit Court of the United States for the Southern District of Ohio April 16, 1861. The original act of incorporation of the O & M. R. R. Co. of the State of Indiana was passed Feb. 14, 1848, and amended Jan. 15, 1849, and Feb. 13, 1851, by two separate acts, and, also, March 3, 1859. This company was foreclosed by decree of the Circuit Court of the United States for the District of Indiana May 14, 1867.

The original charter of the O. & M. R. R. Co. of the State of Illinois was passed Feb. 12, 1851, and amended Jan. 22, 1852, Feb. 11, 1853, and Feb. 24, 1854. This company was foreclosed by decree of the Circuit Court of the United States for the Southern District of Illinois March, 1862, and was purchased by the O. & M. R'y Co. of the State of Illinois, which had been incorporated by a special act Feb. 5, 1861.

The O. & M. R'y Co. of Ohio was consolidated with the O. & M. R. R. Co. of Indiana and the O. & M. R'y Co. of Illinois Nov. 4, 1867, with the name O. & M. R'y Co. Articles of consolidation were filed in the office of the Secretary of State for the State of Ohio Nov. 26, 1867. The termini of the new organization were Cincinnati, in the State of Ohio, and East St. Louis, in the State of Illinois, with a branch from North Vernon, in the State of Indiana, to Jeffersonville, in the State of Indiana.

On the 30th of January, 1875, the O. & M. R'y Co. purchased a railroad extending from Shawneetown, in the State of Illinois, to Beardstown, in the State of Illinois. This road was then known as the Spring-

field & Illinois South Eastern R. R., which had been originally constructed under charters granted as follows, viz.: The original charter of the Springfield and Pana R. R. Co. was passed Feb. 16, 1867, and amended April 16, 1869, the name being changed to the Pana, Springfield & N. W. R. R., and again amended April 19, 1869. The original charter of the Ill. & S. E. R. R. was granted Feb. 27, 1867, and amended Feb. 24, 1869, extending the authority to construct this road to a point on the Mississippi river not north of Rock Island and not south of Quincy, with the power to build branches and erect telegraph lines. The Pana, Springfield & N. W. R. R. and the Illinois and S. E. R. R. consolidated, by agreement of consolidation dated Dec. 7, 1869, and the name of Springfield & Ill. S. E. R'y Co. was adopted. This railway was sold under a decree of foreclosure in the Circuit Court of the United States for the Southern District of Illinois Sept. 15, 1874, by a deed of conveyance made to M. H. Bloodgood Jan. 18, 1875, and re-conveyances were made as follows, viz.: From M. H. Bloodgood to F. Schuchardt and John Bloodgood, and their wives, respectively; to Daniel Torrance and wife Jan. 19, 1875; and from Daniel Torrance and wife to the O. & M. R'y Co. Jan. 30, 1875.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. T. McClintick .....	President .....	Cincinnati, O. ....	\$2,000
John King, Jr. ....	Receiver .....	" .....	12,000
W. M. Walton .....	Secretary .....	New York City .....	2,700
Chas. S. Cone .....	Treasurer .....	Cincinnati, O. ....	2,500
Andrew Donaldson .....	Auditor .....	" .....	2,500
W. W. Peabody .....	General Superintendent ..	" .....	6,000
N. A. Guernsey .....	Chief Engineer .....	" .....	1,500
W. Duncan .....	General Freight Agent .....	St. Louis, Mo. ....	4,000
Chas. S. Cone, Jr. ....	General Ticket Agent .....	Cincinnati, O. ....	3,300

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Adrian Iselm, Jr. ....	New York City..	Robt. Garrett .....	Baltimore, Md.
Theo. J. Meier .....	St. Louis, Mo. ....	Henry M. Day .....	New York City.
W. W. Scarborough .....	Cincinnati, O. ....	John Waddle .....	Cincinnati, O.
Wm. Whiteright .....	New York City..	Osmun Latrobe .....	Baltimore, Md.
W. T. McClintick .....	Cincinnati, O. ....	James Sloan, Jr. ....	" .....
Chas. A. Beecher .....	" .....	Frank W. Tracy .....	Springfield, Ill.
Robt. L. Cutting, Jr. ....	New York City..		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$20,000,000 00
preferred.....	5,000,000 00
Number of shares—common.....	200,000
preferred .....	50,000
	250,000
Par value of each—common .....	\$100 00
preferred ....	100 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$20,000,000 00
preferred .....	5,000,000 00
	\$25,000,000 00
Amount subscribed—common.....	\$20,000,000 00
preferred .....	4,030,000 00
	24,030,000 00
Total paid in capital stock—common .....	\$20,000,000 00
preferred.....	4,030,000 00
	24,030,000 00
Average amount paid in per mile of single main track (393 miles).....	61,145 00
Proportion of same for Ohio (19.52 miles) .....	1,193,550 40

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For subscriptions paid in cash—Number shares, 240,300; amount of common, \$20,000,000.00; amount of preferred, \$4,030,000.00.

Stockholders, residents of Ohio, 19.

Amount of stock held by them June 30, 1881, 3,803 shares, \$380,300.00.

Agents authorized to transfer stock: W. M. Walton, 52 William Street, New York City.

Number of shares transferred within the year at such agencies, 537,563.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Am't actually issued.
1st mortgage .....	Mortgage.....		Jan'y 1, 1898	7%		\$6,716,000
2d mortgage .....	" .....		April 1, 1911	7%		3,833,000
Income and fund.debt	" .....		Oct. 1, 1882	7%		174,000
Sinking fund.....			May 1, 1883	7%		140,000
Springfield Division, 1st mortgage .....	Mortgage.....		April 1, 1905	7%		1,972,000
Total.....						\$12,835,000

Average amount per mile of single main track (616.2 miles) .....	\$20,829 27
Proportion of same for Ohio (19.52 miles).....	406,587 35
Decrease since June 30, 1880 .....	6,000 00
Amount in hands of trustees of sinking fund for redemption.....	13,438 75

## OTHER INDEBTEDNESS.

Coupons and sinking funds due and unpaid.....	\$1,223,655 00	
All other debts, current credit balances, etc.....	614,599 43	
Total unfunded debt.....	1,838,254 43	
Cash securities, debit balances, etc., available to payment	535,820 48	
Net unfunded debt .....		\$1,302,433 95
Average amount per mile of single main track.....	\$2,113 65	
Proportion of same for Ohio .....	41,258 45	
Decrease since June 30, 1880 .....	475,356 66	
Total net debt liabilities.....		14,137,433 95
Average amount per mile of single main track .....	\$22,942 92	
Proportion of same for Ohio.....	447,845 80	
Total of paid in stock and debt .....		38,167,433 95
Total average amount per mile .....	\$61,940 01	
Proportion of same for Ohio.....	1,209,069 00	

## COST OF ROAD EQUIPMENT, Etc.

Equipment and real estate—Prior to July 1, 1880, \$32,145,959.07; for the year ending June 30, 1881, \$64,500.42; total expenditures to July 1, 1881, \$32,210,459.49.

## ROAD ACQUIRED BY PURCHASE.

Springfield and Illinois South-eastern Railway (Springfield Division of O. & M. R'y) purchased for .....	\$1,770,000 00
Subsequent expenditures for construction on Springfield Division. ...	73,081 48
Total expended for construction and purchase .....	34,053,540 97
Average cost per mile of road constructed, single main track, 393 miles (\$32,210,459.49) .....	81,960 45
Average cost per mile of road owned by company, single main track, 616.2 miles (\$34,053,540.97).....	55,263 78
Proportion of same for Ohio, 19.52 miles (\$34,053,540.97).....	1,078,748 99

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cincinnati, O., to E. St. Louis, Ill .....	338.03	19.52
North Vernon, Ind., to Jeffersonville, Ind...	53.31	
Beardstown, Ill., to Shawneetown, Ill .....	224.86	
Total single main track .....	616.20	19.52
Aggregate of sidings and other tracks .....	93.03	10.40
Total length laid with rail computed as single track .....	709.23	29.92

Laid with steel rail .....	357.	19.52
Length in Ohio, distributed as follows:		
Hamilton county, main track, 19.52; sidings, etc., 10.40; total, 29.92.		
Steel rail—All steel in Ohio.		

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4 ft. 9 in.
Grade—Maximum, per mile.....	59 feet.
Longest maximum.....	7,500 "
Aggregate length of maximum .....	7,500 "
Curvature—Shortest radius.....	955 "
Aggregate length of shortest radius.....	15,430 "
Aggregate length of all radii.....	608,180 "
Aggregate length of tangent .....	501.02 miles.
Rail—Iron—On road, including sidings .....	352.23 "
Average weight per yard.....	55 lbs.
Steel—On road .....	357 miles.
Average weight per yard.....	52 to 60 lbs.
Ties—Average number per mile.....	2,800
Number laid during the year .....	190,596
Ballasted—On whole line .....	229 miles.
In Ohio .....	19.52 "
With gravel and rock.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 2; greatest age, 6 years; aggregate length .....	138 feet.
Iron, 1; greatest age, 11 years; aggregate length.....	367 feet.
Stone arch, 11; greatest age, 26 years; aggregate length...	121 feet.

Total ..... 626 feet.

Trestles—3; greatest age, 6 years; greatest height, 52 feet; greatest length, 196; aggregate length, 392.

Length of shortest span of truss, 24 ft.; of longest, 26 feet; greatest length of beams between points of support, if not trussed, 18 feet.

Greatest space between cross ties upon bridges and trestles, 6 inches; length of ties, 12 feet.

Number of track stringers, 4.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Weekly.

Are the examinations analytical, and are they made by a competent person? Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line, whole line, 611 miles, 3,694 feet; in Ohio, 6 miles.

Kind of fencing, as follows:

Post and board (average cost per rod, \$1.00), 610 miles 5,014 feet.

Wire (average cost per rod, 82 cents), 3,960 feet.

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

At Storrs one of our side tracks crosses the C., I., St. L. & C. R. R.

Number of crossings of highways at grade in this State without protection, 9.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 3.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated, 616.2—in Ohio .....	15
Miles of same owned by railroad company, 391.34—in Ohio.....	15

##### STATIONS.

Passenger and freight .....	126; in Ohio,	5
Number with telegraph communication.....	82; “	5
Is pay received for messages sent over line owned by railroad company? No.		

#### ROLLING STOCK.

Locomotives.....	122; Average weight, lbs .....	126,000
Express and baggage cars and mail.....	26; “ “ .....	35,000
Passenger cars.....	49; “ “ .....	45,000
Parlor and sleeping cars.....	9; “ “ .....	60,000
Freight cars.....	2,394; “ “ .....	18,000
Other cars.....	12; “ “ .....	16,000

Number of locomotives equipped with train brakes, 33.

Kind of brake: Loughridge Air brake.

Number of cars equipped with train brakes, 78.

Kind: Loughridge Air brake.

Number of passenger cars with “Miller Platform,” 78.

Method of bridging between passenger cars, when two or more are run in trains:  
Miller Platform.

State methods of heating cars used for the transportation of passengers: Baker heaters and Spear coal stoves.

Means of lighting same: Candles and oil lamps.

##### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	32 miles per hour.
Mail and accommodation, .....	22 “
Freight trains, .....	13 “



## EMPLOYES.

Superintendents .....	3
Telegraph operators .....	50
Engineers .....	150
Baggagemen .....	40
Flagmen, switch-tenders and watchmen.....	130
Laborers .....	300
Clerks .....	200
Train dispatchers .....	9
Firemen .....	150
Wipers .....	170
Mechanics .....	535
Conductors .....	97
Brakemen.....	200
Station agents .....	160
Section men .....	910
Other employees .....	401

Total number employed by Company in operating line..... 3,505

Proportion for Ohio..... 111

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American on Springfield division, between Altamont, Ill., and Beardstown, Ill. Adams between Louisville and St. Louis only.

Terms: American, \$20 per day for 3,500 lbs.; excess one-half first class rates. Adams, 1.31 cents per 100 lbs., and one half earnings on money traffic between the two points named.

Special freight and transportation lines: Continental Line, Great Western Dispatch Company.

Terms as to rates (use of track, machinery, repair of cars), etc., with each: Both co-operative—each road forming the lines furnishing its pro rata of cars. Earnings and expenses pro rated on a mileage basis.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives .....	{ Passenger .....	15	Ties .....	{ Oak .....	5
	{ Freight.....	15		{ Cedar.....	7
	{ Passenger .....	15	Bridges .....	{ Combination.....	15
	{ Baggage .....	15		{ Trestles.....	9
Cars .....	{ Box .....	12		{ Piling .....	9
	{ Stock.....	12	Fence posts.....		5
	{ Coal .....	10			
	{ Flat .....	10			

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Rail laid—Steel, 60 lbs. per yard—miles of track.....	112.5; in Ohio, 2 mi., 3,594 ft.
Train mileage—Passenger.....	1,250,683
Freight.....	2,185,766
Construction.....	4,397
Total.....	3,440,846
Car mileage—Passenger.....	4,595,657
Freight—loaded.....	28,809,645
empty.....	9,603,215
Caboose.....	2,185,766
Construction and other.....	26,382
Total.....	45,220,665
Fuel consumed—Coal, 165,174½ tons; total cost.....	\$223,839 05
Losses, etc., paid—On goods and baggage.....	17,138 82
For animals killed in Ohio:	
Cattle, 5.....	123 00

## TRANSPORTATION.

Passengers—Number carried, local.....	788,514
through.....	95,817
Total.....	884,331
Average number of miles traveled by each.....	59.77
Total mileage, or number carried one mile.....	52,864,587
Average amount received for each.....	\$1405
Average amount per mile received for each.....	2.3519 cents.
Freight—Tons carried, local.....	853,628
through.....	685,131
Total.....	1,538,759
Total movement, or tons carried one mile.....	282,875,316
Average amount received for each ton.....	\$1.9167
Average amount per mile received for each ton.....	1.043 cents.

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation.....	\$1,243,336 48
Freight transportation.....	2,949,349 53
Mail service.....	86,575 13
Express service.....	156,453 41
Total earnings of line operated included in this report.....	\$4,435,714 55

## ANNUAL REPORT.

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$996,499 81	
Maintenance of cars.....	223,500 12	
Motive power.....	246,969 14	
Conducting transportation.....	1,657,375 11	
General expenses:		
Taxes in Ohio.....	\$4,823 09	
Indiana, Illinois.....	} 77,941 31	
Missouri, Kentucky.....		
		82,764 40
Salaries.....	68,389 13	
Other general expenses of operating .....	41,560 21	
<hr/>		
Total operating expenses, being 74.784 per cent of earnings...	\$3,317,057 92	
Net earnings of 616.20 miles operated .....	1,118,656 63	
Net income over operating expenses and rents paid.....	1,118,656 63	
Percentage of same to capital stock and debt.....	2.93	
Percentage of to total means applied to construction, etc.....	3.28	
Per mile of earnings (616.2 mi.), \$7,198 49; Proportion for Ohio (19.52 mi.)	140,514 52	
operating expenses... 5,383 08;	" 105,077 72	
net earnings..... 1,815 41;	" 35,436 80	

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Decrease of assets.....	\$254,522 17
-------------------------	--------------

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$1,107,120 10	
Interest on floating debt.....	16,988 89	
Bonds of company canceled (par value, \$6,000).....	6,000 00	
Floating debt liquidated .....	145,969 17	
Expenses of O. & M. R'y prior to Nov. 17, 1876, (since audited).....	13,600 22	
Legal expenses by order of court.....	19,000 00	
Additional real estate.....	64,500 42	
		\$1,373,178 80
Memoranda:		
Other payments.....	\$1,373,178 80	
Other receipts .....	254,522 17	
		<hr/>
Net earnings .....	\$1,118,656 63	

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Common stock .....	\$20,000,000 00	
Preferred stock.....	4,030,000 00	
Funded debt .....	12,835,000 00	
Pay-rolls.....	140,559 13	
Individuals, R. R. Co.'s, etc.....	474,040 30	
Coupons and Sinking Funds due and unpaid.....	1,223,655 00	
	<hr/>	\$38,703,254 43

## ASSETS.

Cost of road equipment, real estate, etc.....	\$34,053,540 97	
Uncollected earnings .....	88,869 11	
Cash on hand .....	188,153 58	
Individuals, R. R. Co.'s, etc.....	108,368 45	
Supplies on hand.....	150,429 34	
Profit and loss.....	\$2,890,237 98	
Coupons and Sinking Funds unpaid.....	1,223,655 00	
	<hr/>	4,113,892 98
		<hr/>
		\$38,703,254 43

## SUMMARY OF ACCIDENTS.

## Persons killed—Causes:

Others—Run over in yards, on sidings, or in switching .....	2
Lying, walking, falling, or being on track.....	2
Employees—Coupling, or caught between cars and engine .....	1
Total.....	<hr/>
	5

## Persons injured—Causes:

Employees—Coupling, or caught between cars and engine .....	1
Others—Lying, walking, falling, or being on track.....	1
Total .....	<hr/>
	2

## RECAPITULATION.

Killed—Employees—misconduct or want of caution.....	1
Others—trespassing, on track, etc. ....	4
Total killed .....	<hr/>
	5
Injured—Employees—misconduct or want of caution.....	1
Others—trespassing on track, etc .....	1
Total injured.....	<hr/>
	2

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

Number.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880, Aug. 3	Michael Burns.....	None .....	Not known; found under switch engine in Cincinnati yard. It is supposed he fell out of car of watermelons. Coroner exonerated company.....	Killed.
2	Aug. 23	John Burney.....	Brakeman .....	Coupling cars; foot caught and he fell. One pair of trucks passed over him.....	Died from injuries.
3	30	Rose Connelly.....	None .....	Child 15 months old playing on track in Cincinnati yard alone. Engine backing up struck her. Coroner exonerated company and employes.....	Killed.
4	Dec. 8 1881.	Jno. Mooney.....	None.....	Attempted to cross track ahead of engine; very old man.....	Killed.
5	Feb. 15	Unknown.....	Tramp.....	Walking on track.....	Very slight.
6	June 23	Thos. Narley.....	Brakeman .....	Coupling cars.....	Arm broken at elbow.
7	28	Fred. Schemel.....	Cooper .....	Attempted to cross track ahead of train...	Killed.

*State of Ohio, County of Hamilton, ss.:*

W. W. Peabody, General Superintendent of the Ohio and Mississippi Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

(SEAL OF R. R.)

Subscribed and sworn to before me, this 14th day of October, A. D. 1881.

(SEAL)

W. W. PEABODY,

*General Superintendent.*

P. WERNER STEINBRECHER,

*Notary Public, Hamilton County, O.*

# OHIO AND WEST VIRGINIA RAILWAY COMPANY.

Name of road: The Ohio and West Virginia Railway.

By whom owned: The Ohio and West Virginia Railway Company.

By whom operated: Same.

By what authority: Stock ownership.

Name of company making this report: The Ohio and West Virginia Railway Company.

General office at Columbus, Ohio.

Principal office in Ohio at Columbus, Ohio.

Address correspondence relating to this report to T. J. Janney, Auditor, at Columbus, Ohio.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
M. M. Greene .....	President .....	Columbus, O. ....	.....
Orland Smith .....	Vice President.....	" .....	.....
W. M. Greene.....	Treasurer and Auditor.....	" .....	.....
Orland Smith .....	General Manager .....	" .....	.....
George R. Carr.....	General Superintendent...	" .....	.....
T. B. Sheldon .....	Chief Engineer.....	" .....	.....
W. H. Harrison .....	Gen'l Pass. and Ticket Agt.	" .....	.....
W. A. Mills .....	General Freight Agent .....	" .....	.....
M. M. Greene .....	Executive Committee }	" .....	.....
W. G. Deshler.....		" .....	.....
C. C. Walcutt .....		" .....	.....
P. W. Huntington .....		" .....	.....
Samuel Thomas .....		" .....	.....
Total salary .....	.....	.....	\$2,300

## DIRECTORS.

Name.	Residence.	Name.	Residence.
George C. Benham .....	Columbus, O. ....	Sam'l Thomas.....	Columbus, O. ....
W. G. Deshler.....	" .....	C. C. Walcutt.....	" .....
D. S. Gray .....	" .....	James A. Wilcox.....	" .....
M. M. Greene.....	" .....	P. W. Huntington.....	" .....
Henry Mitler .....	" .....	J. A. Hamilton .....	Gallipolis, O. ....
Charles Parrott.....	" .....	George McQuigg .....	Pomeroy, O. ....
Orland Smith .....	" .....		

## CAPITAL STOCK.

Capital stock authorized by law	Amount—common .....	\$2,500,000 00
	No. shares—common .....	50,000
	Par value of each—common .....	\$50 00
Capital stock authorized by vote of company—common .....		750,000 00
Amount subscribed—common .....		750,000 00
Total paid in capital stock—common .....		750,000 00
Increase since June 30, 1880—common .....		750,000 00
Average amount paid in per mile of single main track, 82 miles .....		9,146 00
Proportion of same for Ohio, 82 miles .....		All.
Capital stock issued, and on what account, as follows :		
For original construction—No. shares, 15,000 ; amount of common...		\$750,000 00
Stockholders, residents of Ohio .....		21
Amount of stock held by them June 30, 1881 .....		750,000 00

## FUNDED DEBT.

1. Kind of bond or oblig'tions.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Coupon bond	1st mortgage....	May, 1880...	May, 1910...	7	\$1,584,000	\$1,584,000

Average amount per mile of single main track (82 miles) .....	\$19,215
Proportion of same for Ohio (82 miles) .....	All.
Increase since June 30, 1880 .....	1,584,000

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc. ....	\$41,759 40
Cash securities, debit balances, etc., available to payment...	6,948 41
Net unfunded debt .....	\$34,810 99
Average amount per mile of single main track .....	\$414 41
Proportion of same for Ohio .....	All.
Increase since June 30, 1880 .....	34,810 99
Total net debt liabilities .....	1,618,810 99
Average amount per mile of single main track .....	\$19,270 41
Proportion of same for Ohio .....	All.
Total of paid in stock and debt. ....	2,368,810 99
Total average amount per mile .....	\$28,200 41
Proportion of same for Ohio .....	All.



## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures for the year ending June 30, 1881.	Total expend- itures to July 1, 1881.
Right of way .....	\$70,497 28	\$70,497 28
Civil engineering .....		
Grading and masonry, steel rails .....		
Bridges included in this.....	1,994,451 69	1,974,451 69
Timber and ties item .....		
Superstructure .....		
Iron rails, chairs, and spikes.....		
Fencing.....	28,401 62	28,401 62
Passenger and freight stations.....	23,079 45	23,079 45
Engine and car houses.....	6,803 72	6,803 72
Telegraph.....	3,099 57	3,099 57
Interest and discount.....	14,175 00	14,175 00
Total expenditures for construction .....	\$2,140,508 33	\$2,140,508 33

Average cost per mile of road constructed (single main track, 82 miles)... \$26,103 76

Average cost per mile of road owned by company (single main track,  
82 miles)..... 26,103 76

Proportion of same for Ohio (82 miles)..... All.

## COST OF EQUIPMENT OWNED BY COMPANY.

8 locomotives .....	\$85,500 68
2 first-class passenger cars .....	8,509 00
2 second-class passenger cars.....	7,550 00
100 box freight cars.....	52,500 00
240 platform cars .....	75,800 00
2 baggage cars.....	4,200 00
4 caboose cars .....	3,200 00
Total cost of railroad equipment owned by company.....	237,259 68
Additions within the year ending June 30, 1881 ....	237,259 68
Average amount per mile (of single main track, 82 miles) .....	2,900 00
Proportion for Ohio (82 miles) .....	All.
Total for road and equipment .....	2,377,768 01
Total average amount per mile (of single main track, 82 miles).....	29,003 76
Proportion of same for Ohio (82 miles).....	29,003 76
Total permanent investment .....	2,377,768 01
Proportion for Ohio (82 miles).....	All.
Average per mile (of single main track, 82 miles).....	29,003 76

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.\*

	Length.	In Ohio.
Single main track, Logan to Pomeroy, O.....	81.91	All.
Total single main track.....	81.91	All.
Aggregate of sidings and other tracks.....	6.26	"
Total length laid with rail computed as single track.....	88.27	All.
Laid with steel rail.....	82.	"
Length in Ohio, distributed as follows:		

County.	Main track.	Sidings, etc.	Total.
Hocking.....	12.69	0.79	13.48
Vinton.....	32.94	2.66	35.60
Gallia.....	30.91	1.72	32.63
Meigs.....	5.37	1.19	6.56
Totals .....	81.91	6.36	88.27
Steel rail.....	81.91	0.09	82.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	4 ft. 9 in.
Grade—Maximum, per mile.....	70 feet.
Longest maximum.....	4,700 "
Aggregate length of maximum .....	8,700 "
Curvature—Shortest radius.....	573 "
Aggregate length of shortest radius.....	2,656 "
Aggregate length of all radii.....	22.24 miles.
Aggregate length of tangent.....	59.67 "
Rail—Iron—On road .....	12 54 "
Average weight per yard.....	52 lbs.
Steel—On road.....	164. miles.
Average weight per yard.....	52½ lbs.
Ties—Average number per mile.....	3,000
Number laid during the year .....	3,000
Ballasted—On whole line.....	88.27 miles.
In Ohio.....	88.27 "
With rock, furnace cinders and gravel.	

\* The road was partially opened October 15, 1880, but no business of consequence was done until it was finally opened for business in January, 1881.

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood..... 14; greatest age... 1 year; aggregate length... 1,150 ft.  
 Combination 4;           “     ... 1 year;           “     ... 466 “

Total..... 1,616 ft.

Trestles—62; greatest age, 1 year; greatest height, 65 ft.; greatest length, 750; aggregate length, about 16,470.

Length of shortest span of truss, 40 feet; of longest, 160; greatest length of beams between points of support, if not trussed, 15 ft.

Greatest space between cross ties upon bridges and trestles, 16 inches; length of ties, 10 and 12 feet.

Number of track stringers, 2 track, and 2 guard rails.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Once in two months.

Are the examinations analytical, and are they made by a competent person? Yes.

Tunnels—Stone, natural roof, 2; aggregate length, 1,192 feet.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole line.	In Ohio.
Number miles fencing, computed as single line, about.....	150	All.
Kind of fencing, as follows:		
Post and board (average cost per rod, about \$1.00) .....	20	All.
Wire (average cost per rod, 75 cents) about.....	130	All.
Average cost of same per rod, 78½ cents.		
Length of road unfenced, and the reason therefor, about.....	13.82	All.
Through towns, etc., not requiring fence.		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Marietta and Cincinnati R. R. at McArthur Junction.

Number of crossings of highways at grade in this State without protection, 62.

Number of crossings of highways over railroad, 3.

“           “           “     under railroad, 3.

Number of highway bridges 18 feet above track, 3.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated, in Ohio.....	82
Miles of same owned by railroad company, in Ohio .....	82

## STATIONS.

Passenger and freight, in Ohio .....	29
Number with telegraph communication, in Ohio .....	13
Number of same operated by railroad company, in Ohio.....	13
Is pay received for messages sent over line owned by railroad company? For commercial message.	

## ROLLING STOCK.

Locomotives .....	8; average weight, lbs.....	110,000
Express and baggage cars .....	2; " " .....	37,000
Passenger cars .....	4; " " .....	42,000
Freight cars .....	340; " " .....	
Other cars .....	4; " " .....	
Number of locomotives equipped with train brakes, 8.		
Kind of brake: Westinghouse air brake.		
Number of cars equipped with train brakes, 6.		
Kind: Westinghouse air brake.		
Number of passenger and baggage cars with "Miller Platform", 6.		
Method of bridging between passenger cars, when two or more are run in trains:		
Miller Platform.		
Are all cars run on this road heated and lighted as prescribed by law? As far as practicable.		
State methods of heating cars used for transportation of passengers: Patent car stove.		
Means of lighting same: Oil and candles.		

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation, .....	22 "
Freight trains, .....	10 "

## EMPLOYEES.

Superintendents .....	2
Telegraph operators .....	3
Engineers .....	9
Baggagemen.....	4
Flagmen, switch-tenders and watchmen .....	2
Clerks .....	3
Train dispatchers.....	1
Firemen .....	12
Wipers.....	3
Mechanics .....	21
Conductors .....	7
Brakemen .....	13
Station agents .....	18

Section men.....	117
Other employes.....	17
Total number employed by company in operating line.....	232
Proportion for Ohio.....	232

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams Express Company.  
 Terms: Temporary contract; no permanent arrangement effected.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles .....	5 Cts.	3 Cts.	4 $\frac{3}{4}$ Cts.
For distances over 8 miles—First class .....	3	2	...
Second class.....	3	2	...
Excursion .....	2 $\frac{1}{2}$	1 $\frac{1}{2}$	...

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton:

First class.....	1	0.243	...
Second class.....	1	0.23	...
Third class.....	1	0.2	...
Fourth class.....	1	0.166	...
Fifth class .....	.55	0.115	...
Special class .....	.37	0.09	...

Rate per ton per mile on freight carried less than 30 miles:

First class.....	5	5	5
Second class.....	5	5	5
Third class .....	5	5	5
Fourth class .....	5	4.5	...
Fifth class .....	4.5	4	...
Special class.....	4	2	...

Rate per ton per mile on freight carried more than 30 miles:

First class.....	5	5	5
Second class.....	4.75	4.6	...
Third class.....	4.5	4.1	...
Fourth class.....	4.25	3.2	...
Fifth class.....	4	2.1	...
Special class.....	3	1	...

Rate per ton per mile for—

Coal—Carried ten miles or more.....	5	1.5	...
Carried less than ten miles.....	5	4	...
Pig iron—Carried ten miles or more.....	5	1.2	...

Carried less than ten miles.....	5	5	5
Limestone—Carried ten miles or more.....	5	1.5	...
Carried less than ten miles .....	5	4.5	...
Iron ore—Carried ten miles or more .....	5	1.4	...
Carried less than ten miles .....	5	4.5	...
Undressed stone or lumber—			
Carried ten miles or more.....	5	1.5	...
Carried less than ten miles .....	5	5	5

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows: All built during the year.			
Trestles built in Ohio, 62; aggregate length, about 16,470 feet.			
Fencing in Ohio—Miles of single fence built (average cost per rod, 78 $\frac{1}{8}$ cts.), 150.			
Grading—Miles of main track graded, in Ohio, all.			
Ballasting—Miles of main track ballasted in Ohio, all.			
Rail laid—Steel.....	lbs. per yard; miles of track .....	8.2	
New iron .....	“ “ “ “ .....	6.27	
Train Mileage—Passenger ..	63,079		
Freight .....	44,929		
Construction .....	6,977		
Total.....			114,985
Car mileage—Passenger.....	105,662		
Express and baggage.....	49,803		
Freight—loaded.....	231,766		
empty.....	69,000		
Caboose .....	27,952		
Construction and other, about.....	40,000		
Total.....			524,183
Fuel consumed—Wood, 69 cords; coal, 2,400 tons; total cost .....			\$3,501 00
Losses, etc., paid—On goods and baggage.....			62 43
For animals killed in Ohio: 3 cattle .....			53 33

## TRANSPORTATION.

Passengers—Number carried, local .....	68,688		
through .....	1,986		
Total.....			70,674
Average number of miles traveled by each.....			23.8
Total mileage, or number carried one mile.....			1,684,498
Average amount received for each.....			60.3 cents.
Average amount <i>per mile</i> received for each .....			2.53 “
Freight—Tons carried, local.....	71,831		
through .....	1,321		
Total .....			73,152

Average tons in each loaded car per mile.....	9.6
Total movement, or tons carried one mile .....	2,233,280
Average amount received for each ton.....	75.8 cents.
Average amount <i>per mile</i> received for each ton.....	2.48 "
Average amount received for each ton through freight .....	\$1 26
Average amount received for each ton local freight .....	74.9 cents.

## Articles transported:

	Tons.	Per cent.
Coal .....	6,052	8.3
Stone, lime, sand, etc. ....	941	1.3
Ores .....	46,138	63
Pig and bloom iron.....	2,624	3.5
Lumber and other forest products .....	6,372	8.7
Grain, flour, and other agricultural products .....	1,037	1.4
Live stock.....	435	0.6
Animal products .....	5,317	7.2
Miscellaneous ..	4,236	6.0

Total tonnage yielding revenue .....	73.152	100.
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## EARNINGS, OPERATING EXPENSES ETC., FOR YEAR ENDING JUNE 30TH.

## EARNINGS.

Passenger transportation—local .....	\$39,309	78
through.....	3,386	48
Total .....		\$42,695 26
Freight transportation—local .....	\$53,825	34
through .....	1,664	46
Total .....		55,489 80
Mail service .....		2,815 33
Express service.....		1,317 30
Other sources .....		6,661 96
Total earnings of line operated included in this report ...		\$108,980 65

OPERATING EXPENSES.

Maintenance of way and structures.....	\$24,293	32
Maintenance of cars .....	2,385	68
Motive power .....	16,023	45
Conducting transportation.....	17,411	80
General expenses:		
Salaries .....	\$2,965	05
Other general expenses of operating .....	3,265	98
	<u>6,231</u>	<u>03</u>
Total operating expenses, being 60.87 per cent. of earnings.....	\$66,345	28

Net earnings of 84 miles operated .....	42,635 37
Net income over operating expenses and rents paid .....	42,635 37
Percentage of same to capital stock and debt, 1.8	
Percentage of to total means applied to construction, etc., 1.8	
Per mile of earnings (84 miles).....	1,297 39
Operating expenses.....	789 78
Net earnings.....	507 61

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock .....	\$750,000 00
Sale of bonds of company.....	1,584,000 00
Increase of floating debt ....	34,810 99
Pomeroy and Middleport donation .....	28,009 15
	<hr/> \$2,396,820 14

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net).....	\$61,687 50
Construction of new work .....	2,140,508 33
Additional equipment .....	237,259 68
	<hr/> \$2,439,455 51

## CONDENSED GENERAL BALANCE SHEET, JULY 1ST, 1881.

## LIABILITIES.

Capital stock .....	\$750,000 00
Bonds issued.....	1,584,000 00
Bills payable.....	20,075 00
Due agents.....	9,460 52
Due connecting roads.....	3,293 32
Due on other accounts.....	7,285 56
Coupons outstanding .....	1,645 00
Contingent account.....	8,957 02
	<hr/> \$2,384,716 42

## ASSETS.

Cash on hand.....	\$3,544 18
Construction .....	2,038,509 86
Equipment.....	237,259 68
Fencing.....	28,401 62
Right of way .....	70,497 28
Telegraph line .....	3,099 57
Supplies on hand.....	1,905 88
Due from agents .....	426 40
"    connecting roads.....	1,002 45
"    from other accounts.....	69 50
	<hr/> \$2,384,716 42



## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No. 1—August 8, 1880, C. W. Horton, passenger brakeman; fell from train while in motion—killed.

No. 2—June 18, 1881, E. G. Dixon, freight brakeman; pinched while coupling cars—lost two fingers.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Employees—Falling or thrown from engine or train..... 1

## PERSONS INJURED—CAUSES.

Employees—Coupling, or caught between cars and engine..... 1

## RECAPITULATION.

Killed—Employees—misconduct or want of caution..... 1

Injured—Employees—misconduct or want of caution..... 1

## TRAIN ACCIDENTS—ENTIRE LINE.

No. 1—May 27, near Creola, freight; train broke in two—slight damage to cars.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains..... 1

Causes of accidents effecting derailment of trains:

Unexplained ..... 1

*State of Ohio, County of Franklin, ss :*

M. M. Greene, President of the Ohio & West Virginia Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

M. M. GREENE, *President.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 29th day of October, A.D. 1881.

[SEAL.]

F. H. MEDARY,

*Notary Public in and for Franklin Co., O.*

## PAINESVILLE, CANTON AND BRIDGEPORT NARROW GAUGE RAILROAD COMPANY.

[From June 30, 1880, to September 28, 1880 ]

Name of road : Painesville, Canton and Bridgeport Narrow Gauge Railroad.  
By whom owned : Chagrin Falls and Southern Railroad Company.  
By whom operated : Chagrin Falls and Southern Railroad Company.  
By what authority : By charter and purchase.  
Name of person making this report : I. W. Pope, President of Painesville, Canton and Bridgeport Narrow Gauge Railroad Company.  
General office at Chagrin Falls, O.  
Principal office in Ohio at Chagrin Falls, O.  
Address correspondence relating to this report to I. W. Pope, President, at Chagrin Falls, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Painesville, Canton and Bridgeport Narrow Gauge R. R. was organized at Minerva, Ohio, Jan. 1, 1875, at the American House, in Carroll county, in said village of Minerva. The certificate of incorporation was duly signed by A. Waddell, H. Beidler, Stanton Weaver, Daniel Eckley and E. R. Eckley, according to the acts of 1852 providing for the creation of incorporations. Certificate was filed with the Secretary of State on the 12th day of January, 1875, with proper certificates of officers attached. The books were advertised for subscription for stock Feb. 4, 1875, to be opened March 8, 1875. A. Waddell, S. Weaver and H. Beidler were the corporators. The same was duly published as required, and certified to before Thomas J. McCobb, J. P. The first meeting of the stockholders was held March 8, 1875, and one hundred thousand and five hundred dollars was subscribed to the capital stock of the Painesville, Canton and Bridgeport Narrow Gauge Railroad Company. They adjourned to hold a meeting for the election of directors at the American House, in the town of Minerva, Carroll county, Ohio, between 10 A. M. and 2 o'clock P. M. of the 15th day of April, A. D. 1875.

AMERICAN HOUSE, MINERVA, O., *April 15, 1875.*

10 A. M. Stock subscribers present—A. Waddell, Stanton Weaver, H. Beidler, P. A. Painter, E. R. Eckley and Daniel Eckley.

A. Waddell was chosen Chairman, H. Beidler, Secretary, and Waddell, Weaver and Beidler were appointed judges of election for directors. The following directors were elected :

A. Waddell.....	2,009 votes.
E. McGunn.....	2,009 "
E. R. Eckley.....	2,009 "
S. Weaver.....	2,009 "
Daniel Eckley.....	2,009 "
P. A. Painter.....	2,009 "
H. Beidler.....	2,009 "

All of whom were duly qualified.

Meeting adjourned.

Directors' meeting on the same day and at the same place.

Organized by electing A. Waddell, President, H. Beidler, Secretary, and P. A. Painter, Treasurer.

Adjourned.

H. BEIDLAR, *Secretary*.

E. R. ECKLEY, *Chairman*.

The company never had any money. Stockholders and officers were irresponsible, but issued bonds on road, the printing of which was never paid for. Learning of the anxiety of the Chagrin Falls people for a road, they came here to make a start, and our people subscribed to take about \$30,000 of the first mortgage bonds on the road between this place and Solon, a distance of about five miles. This scheme failed. After some work had been done and some rights of way obtained during the year 1876, the contractors, failing to receive any money on bonds or from the company, failed to complete that part of the road between Chagrin Falls and Solon. Nothing further in the way of work was done until October, 1877, when a party in Chagrin Falls entered into a contract to build the five miles of road between Solon and Chagrin Falls, which they built and had in operation Dec. 10, 1877, although their contract did not close until June 1, 1878, at which time the railroad company failed to fulfill its conditions in contract, and the contractors retained possession of the road, and continued to do so until the year 1879, when the company sued for some rights of way unpaid for, and asked that the road be sold to pay one George Gee for said rights of way. The contractors filed cross-petitions to protect their claims for construction, and others were filed until the amount reached something over \$8,000. The road was sold Sept. 28, 1880, by J. H. Rhoades, Receiver, to I. W. Pope, J. W. Williams and Wm. Hutchings, purchasing committee for judgment owners and bond-holders, which committee subsequently conveyed, or had it conveyed, to the Chagrin Falls and Southern Railroad Company, which company was chartered in October, 1880, and organization completed in January, 1881. The P., C. & B. N. G. R. R. is now a railroad company only in name, with I. W. Pope, President, and H. Beidler, Sec-

retary. J. W. Williams, John S. Ballard, Wm. Hutchings, E. Sheffield and A. Adams, Directors, now meet in Chagrin Falls, but do not do business. The stock is mostly owned by J. Waddell, but is in the hands of other parties, with proxies, for voting purposes only.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
I. W. Pope.....	President.....	Chagrin Falls, O.....	.....
H. Beidler.....	Secretary.....	Minerva, O.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Wm. Hutchings.....	Chagrin Falls ...	J. S. Ballard.....	Chagrin Falls.
J. W. Williams.....	“ ..	A. Adams.....	“
E. M. Sheffield .....	“ ..		

## CAPITAL STOCK.

Capital stock authorized by law—Amount—common.....	\$1,000,000 00
Amount subscribed—common.....	100,500 00
Capital stock issued, and on what account, as follows :	
Amount of common—For subscriptions paid in cash .....	500 00
For services rendered.....	100,000 00

Stockholders residents of Ohio, 9.

Amount of stock held by them June 30, 1881, 761 shares, of which A. Waddell owns 750; Daniel Eckley, 2 shares; I. W. Pope, 2; E. M. Sheffield, 1; H. Beidler, 2; J. W. Williams, 1; William Hutchings, 1; A. Adams, 1.

## PAINESVILLE & YOUNGSTOWN RAILWAY COMPANY.

Name of road: Painesville & Youngstown Railway.

By whom owned: Painesville & Youngstown Railway Company.

By whom operated: Painesville & Youngstown Railway Company.

By what authority: Charter.

Name of Company making this report: Painesville & Youngstown Railway Co.

General office at Painesville, Ohio.

Principal office in Ohio at Painesville.

Address correspondence relating to this report to George M. Patten, Painesville, Lake County, Ohio.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
C. Meyer.....	President.....	114 Duane St., New Y'k.....	
Miles R. Martin.....	Vice President.....	Painesville, O.....	
A. B. Cornell.....	Secretary.....	Youngstown, O.....	
R. K. Paige.....	Treasurer.....	Painesville, O.....	
George M. Patten.....	General Manager.....	".....	\$3,600
J. A. Newcome.....	Superintendent.....	".....	1,500
H. W. Poor.....	} Executive Committee.. {	New York City.....	
R. K. Paige.....		Painesville, O.....	
W. G. Hawkins.....		".....	

### DIRECTORS.

Name.	Residence.	Name.	Residence.
C. Meyer.....	New York City..	R. K. Paige.....	Painesville, O...
H. W. Poor.....	".....	W. G. Hawkins.....	".....
Paul Wick.....	Youngstown, O..	M. R. Martin.....	Cleveland, O....
A. B. Cornell.....	".....		

### CAPITAL STOCK.

Capital stock authorized by law—Amount— common.....	\$2,200,000 00
Number of shares—common.....	44,000
Par value of each—common.....	\$50 00
Amount issued—common.....	260,575 00

Stockholders residents of Ohio, 17.

Amount of stock held by them June 30, 1880, \$53,925.

Agents authorized to transfer stock: All transfers of stock are made at the general office of the company.

Number of shares transferred within the year at such agencies, 239.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage.....	Road.....	Sept., 1879	Jan. 1910	7	\$400,000	\$400,000
2d income mort.	Earnings of road	1879	1915	7	1,000,000	964,200
Total .....	.....	.....	.....	.....	1,400,000	\$1,364,200

Average amount per mile of single main track (61.8 miles).....	\$22,655 72
Increase since June 30, 1880.....	375,000 00

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$18,571 26
Total unfunded debt .....	18,571 26
Cash securities, debit, balances, etc., available to payment.....	152,853 73
Decrease since June 30, 1880.....	20,803 35
Total net debt liabilities.....	\$13,642 00
Average amount per mile of single main track.....	\$22,090 61
Total of paid in stock and debt.....	1,364,200 00
Total average amount per mile .....	\$22,090 61

## COST OF ROAD EQUIPMENT, Etc.

Cost of road equipment to July 1, 1880—expenditures prior to July 1, 1880, \$1,288,205.20; expenditures for the year ending June 30, 1881, \$18,571.26; total expenditures to July 1, 1881, \$1,306,776.46.

## EQUIPMENT OWNED BY COMPANY.

Seven locomotives, 3 first-class passenger cars, 3 second-class passenger cars, 23 box freight cars, 124 platform cars, 2 baggage cars, 1 mail and express car, 8 section cars.

## COST OF PROPERTY PURCHASED BY COMPANY NOT INCLUDED IN THE FOREGOING ACCOUNT.

Steamboats—Tug, \$2500.

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio
Single main track, Fairport to Youngstown .....	61.8	All.
Aggregate of sidings and other tracks .....	5.35	
Total length laid with rail computed as single track .....	67.15	

Length in Ohio, distributed as follows :

County.	Main track.	Branches.	Sidings, etc.	Total.
Lake.....	8.68	.....	1.92	10.60
Geauga.....	22.59	.....	1.44	24.03
Trumbull.....	27.34	.....	1.07	28.41
Mahoning.....	3.19	.24	.68	4.11
Totals.....	61.8	.24	5.11	67.15

#### Gauge, Grade, Curvature, Rails, Etc.

Gauge.....	3 feet.
Grade—Maximum, per mile .....	80 feet.
Rail—Iron—On road, main line and sidings .....	67.15 miles.
Average weight per yard.....	35 lbs.
Ties—Average number per mile.....	2,600
Number laid during the year .....	8,643
Ballasted—With gravel and mill cinder.	

#### Bridges, Trestles, Etc., in Ohio.

Bridges—Wood, 10; greatest age, 9 years; aggregate length, 1,247 feet.	
Stone arch, 3; aggregate length, 485 feet. Total, 1,732.	
Trestles—19; greatest age, 8 years; greatest height, 36 feet; greatest length, 843 feet; aggregate length, 6,338 feet.	
Length of shortest span of truss, 35 feet; of longest, 144 feet; greatest length of beams between points of support, if not trussed, 11 feet.	
Greatest space between cross ties upon bridges and trestles, 20 inches, centre to centre; length of ties, 7 feet.	
Number of track-stringers, 2.	
Are all bridges and trestles provided with guard rails? Not all.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? About once each month.	
Are the examinations analytical, and are they made by a competent person? Yes, by our master bridge builder.	

#### Fencing—Average and Aggregate Cost.

Number miles fencing, computed as single line, whole line, 122.	
Kind of fencing, as follows :	
Post and board (average cost per rod, \$1.25), whole line, 90.	
Wire (average cost per rod, 90 cents), whole line, 17.9.	
Average cost of fencing per rod, \$1.00.	
Length of road unfenced, and the reason therefor: About 12 miles, for want of material, time and labor.	

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Lake Shore and Michigan Southern Railway at Painesville.

New York, Pennsylvania and Ohio Railroad at Warren.

Cleveland and Mahoning Valley Railroad near Niles.

Niles and New Lisbon Railroad near Niles.

Youngstown and Austintown Railroad near Youngstown.

What railroads cross your road either over or under your grade in this State, and where?

Ashtabula and Pittsburgh Railway at Warren.

Ashtabula and Pittsburgh Railway at Niles.

Number of crossings of highways at grade in this State without protection, 61.

" " over railroad, 4.

" " under railroad, 4.

" highway bridges 18 feet above track, 2.

" " less than 18 feet above track, 2.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes, all, except Youngstown and Austintown Road, which is a coal switch.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated.....	61.8
Miles of same owned by railroad company jointly with W. U. Tel. Co .....	61.8

## STATIONS.

Passenger and freight.....	10
Number with telegraph communication .....	10
Number of same operated by railroad company jointly with W. U. Tel. Co.....	10
Is pay received for messages sent over line owned by railroad company? Yes, by W. U. Telegraph Company.	

## ROLLING STOCK.

Locomotives .....	7; Average weight.....	50,100 lbs.
Express and baggage cars.....	3; " .....	15,000 "
Passenger cars .....	6; " .....	16,000 "
Freight cars.....	147; " .....	9,000 "
Other cars .....	12; " .....	5,000 "

Above includes not owned by company reporting.

50 freight cars owned by J. B. Ford.

Terms of service: To be purchased by this company.

Number of locomotives equipped with train brakes: None.

Kind of brake: Hand brake on tender.

Number of cars equipped with train brakes: None.



Kind: Hand brake.

Number of passenger cars with "Miller Platform": Two.

Method of bridging between passenger cars, when two or more are run in trains: Miller patent platform and buffer.

State methods of heating cars used for the transportation of passengers: Coal stoves using bituminous coal.

Means of lighting same: Coach candles in glass globes.

#### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	17 miles per hour.
Mail and accommodation .....	17 "
Freight trains .....	10 "

#### EMPLOYES.

General Manager.....	1
Superintendents.....	1
Master mechanic .....	1
Telegraph operators and station agents.....	10
Engineers .....	6
Flagmen, switch-tenders, watchmen and car inspectors .....	5
Laborers .....	48
Clerks .....	1
Train dispatchers.....	1
Firemen .....	6
Wipers.....	2
Mechanics .....	19
Conductors .....	5
Brakemen .....	6
Section men (foreman) .....	8
Other employees .....	6

Total number employed by Company in operating line.....	126
Proportion for Ohio .....	All.

#### EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union.

Terms: One and one-half first-class rates.

Equipment and superstructure—Average life of oak ties, 8 years.

#### RATES OF TRANSPORTATION.

##### PASSENGERS.

Fare charged per mile:

	Highest.	Lowest.	Average.
For distances less than 8 miles.....	4.17 Cts.	3 Cts.	3.5 Cts.
For distances over 8 miles—1st class.....	3	3	3
Excursion .....	2		

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class .....	2.333 Cts.	03.00 Cts.	05.00 Cts.
Second class .....	2.000	02.66	04.29
Third class .....	1.666	02.33	03.57
Fourth class .....	1.333	02.00	02.86

Rate per ton per mile on freight carried less than 30 miles :

First class .....	37.50	4.464	7.466
Second class .....	36.50	4.030	6.320
Third class .....	31.10	3.800	5.500
Fourth class .....	35.00	3.500	5.000

Rate per ton per mile on freight carried more than 30 miles :

First class .....	4.28	4.00	4.00
Second class .....	4.10	3	3.80
Third class .....	4.00	3	3
Fourth class .....	4.00	3	3

Rate per ton per mile for—

Coal—Carried 10 miles or more .....	2.564	1.666	1.635
Carried less than 10 miles.....	6.819	6.819	6.819
Pig iron—Carried 10 miles or more.....	1.666	1.666	1.666
Limestone—Carried ten miles or more.....	1.666	1.666	1.666
Iron Ore—Carried ten miles or more.....	1.048	1.048	1.048
Undressed stone or lumber—Carried 10 miles or more .....	1.666	1.666	1.666
Carried less than 10 miles .....	2.564	1.666	1.666

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Train mileage—Passenger .....	38,170	
Freight .....	26,582	
Mixed .....	34,835	
Total .....		99,587
Car mileage—Passenger.....	70,292	
Express and baggage .....	76,785	
Freight—loaded... ..	424,436	
empty.....	329,172	
Caboose .....	12,909	
Construction and other .....	672	
Total.....		914,266
Fuel consumed—Wood, 30 cords; coal, 3,987 tons. Total cost .....		\$9,968 22
Losses, etc., paid—On goods and baggage .....		9 03
For injuries in Ohio, fatal and non-fatal:		
to employees .....		59 00

For animals killed in Ohio :

1 horse.....	\$100 00
9 cattle.....	234 00
	<hr/>
Total .....	\$334 00

## TRANSPORTATION.

Passengers—Number carried, local .....	35,570
through.....	414
Total .....	35,984
Average number carried in each car per trip.....	22.72
Average number of miles traveled by each.....	17.52
Total mileage, or number carried one mile.....	630,578
Average amount received for each.....	48.71 cts.
Average amount <i>per mile</i> received for each .....	2.78 cts.
Freight—Tons carried, local.....	18,540
through .....	48,323
Total.....	66,863
Average tons in each loaded car per trip.....	3.14
Average tons in each loaded car per mile .....	8.14
Total movement, or tons carried one mile.....	3,458,262
Average amount received for each ton.....	80.77 cts.
Average amount <i>per mile</i> received for each ton .....	1.56 cts.
Average amount received for each ton through freight .....	73.38 cts.
Average amount received for each ton local freight.....	1,000.7 cts.

## Articles transported:

	Tons.	Per cent.
Coal.....	1,897	2.83
Stone, lime, sand, etc.....	956	1.45
Petroleum.....	94	.14
Ores.....	50,918	76.15
Pig and bloom iron.....	230	.34
Manufactured iron.....	209	.32
Lumber and other forest products.....	7,528	11.25
Grain, flour, and other agricultural products.....	851	1.27
Live stock.....	20	.02
Animal products.....	1,267	1.89
Manufactures, including agricultural implements.....	525	.79
Merchandise.....	890	1.33
Miscellaneous.....	1,478	2.22
Total tonnage yielding revenue.....	66,863	100
Supplies for company's use.....	4,405	



Bills payable.....	50 41	
Labor—June pay-rolls (balance).....	9,133 26	
Sundry credit balances.....	13,983 65	
Unclaimed pay.....	42 55	
Bond account.....	199,331 67	
		<hr/> \$1,847,316 54

## ASSETS.

Construction and equipment (being cost of road and equipment to present company).....	\$1,688,310 48	
Painesville Savings and Loan Ass'n (balance in bank)...	10,063 17	
Due from United States Post-office Department.....	1,280 73	
“ station agents.....	155 02	
Cash (in New York).....	141,354 81	
Profit and loss.....	6,152 33	
		<hr/> \$1,847,316 54

## TRAIN ACCIDENTS—ENTIRE LINE.

*Return of accidents to trains occurring within the year ending June 30, 1881.*

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
April 21	Girard.....	Freight .....	Tree on track .....	Engine off track ; no damage done.

## SUMMARY OF TRAIN ACCIDENTS.

Number :

Total accidents.....	1
Causes of accidents effecting derailment of trains :	
Tree across track .....	1

*State of Ohio, County of Lake, ss.:*

Geo. M. Patten, General Manager, officer in charge, of the Painesville and Youngstown Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

Subscribed and sworn to before me this 31st day of August, A. D. 1881.

[SEAL.]

G. M. PATTEN,

*General Manager.*

GEO. W. ALVORD,

*Notary Public of Lake County, Ohio.*

## PAULDING & CECIL RAILWAY COMPANY.

Name of road : Paulding & Cecil Railway.

By whom owned : Paulding & Cecil Railway Company.

By whom operated : Paulding & Cecil Railway Company.

By what authority : Charter.

Name of person making this report : S. Frank Eagle, President Paulding & Cecil Railway Company.

General office at Paulding Furnace, Cecil, Ohio.

Principal office in Ohio at Paulding Furnace, Cecil, Ohio.

Address correspondence relating to this report to Cecil, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Information given previously.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
S. Frank Eagle .....	President .....	Cecil, Ohio .....	\$833 33
A. S. Latty.....	Secretary .....	Defiance, Ohio.....	.....
S. Frank Eagle .....	Treasurer .....	Cecil, Ohio .....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
S. Frank Eagle .....	Cecil, Ohio.....	L. B. Peaslee .....	Defiance, Ohio..
A. S. Latty .....	Defiance, Ohio..	C. F. Stuart .....	Cleveland, " ..
Henry Newbegin.....	Defiance, Ohio..		

### CAPITAL STOCK.

Capital stock authorized by law : Amount—common .....	\$25,000 00
Number of shares—common.....	500
Par value of each—common.....	50 00
Amount subscribed—common.....	\$13,250 00

Stockholders, residents of Ohio, 5.

Amount of stock held by them June 30, 1881, \$250.00.

Number of shares transferred within the year, 1.

## OTHER INDEBTEDNESS.

Total unfunded debt.....	\$23,773 75
Cash securities, debit balances, etc., available to payment...	2,094 58
Net unfunded debt .....	\$21,679 17

## COST OF ROAD AND EQUIPMENT, Etc.

## EQUIPMENT OWNED BY COMPANY.

Number—

Two locomotives, 1 second-class passenger car, 10 platform cars, 1 hand-car, 9 dump cars.

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cecil to Paulding .....	6.4	6.4
Total single main track.....	6.4	6.4
Aggregate of sidings and other tracks .....	.9	.9
Total length laid with rail computed as single track.....	7.3	7.3

Length in Ohio, distributed as follows:

Paulding county—main track, 6.4; sidings, etc., .9; total, 7.3.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge, standard.....	4 ft. 8½ in.
Rail—Iron—On road.....	All iron.
Average weight per yard .....	About 35 lbs.
Ties—Average number per mile.....	About 2,500
Ballasted—On whole line .....	2 miles
With furnace cinder.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 12; greatest age, 1 year; aggregate length, 443½ feet.  
 Trestles—1; greatest age, 1 year; greatest height, 12 feet; greatest length, 740 feet.  
 Greatest space between cross ties upon bridges and trestles, 8 inches.  
 Are all bridges and trestles provided with guard rails? No.  
 Do all bridges and trestles receive stated examinations? No regular time.

## ROLLING STOCK.

Locomotives.....	2; average weight.....	44,000 lbs.
Passenger cars.....	1.	
Other cars .....	20.	

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Stoves.

Means of lighting same: Run in day time only.

## SPEED OF TRAINS.

Express passenger, average rate, including stops..... 7 miles per hour.

## EMPLOYEES.

Engineers .....	2
Clerks .....	1
Firemen .....	2
Conductors.....	1
Brakemen.....	2
Section men.....	6

Total number employed by company in operating line ..... 14  
 Proportion for Ohio ..... All.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.
Fare charged per mile—For distances less than 8 miles .....	6½c.	...

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

First class.....	15	...
Second class.....	12	...
Third class.....	10	...
Fourth class.....	8	...

Rate per ton per mile for—

Coal—Carried ten miles or more .....	12½	...
Pig iron—Carried ten miles or more.....	12½	...
Limestone—Carried ten miles or more .....	12½	...
Iron ore—Carried ten miles or more .....	12½	...

## TRANSPORTATION.

Passengers—Number carried, May and June, 1881..... 1,301

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$13,250 00	
Profit and loss.....	677 52	
Floating debt .....	23,773 75	
	<hr/>	\$37,701 27



## ASSETS.

Cash.....	\$854 28	
Debts receivable .....	960 10	
Bills receivable.....	280 20	
Construction .....	23,368 46	
Equipment.....	11,086 71	
Real estate.....	1,151 52	
		<hr/> \$37,701 27

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30.

No. 1—February 19, 1881, Robert Wiley, wood chopper; intoxicated and lying on track; train breaking, ran over him—killed.

No. 2—February 19, 1881, Wm. Murphy, conductor; intoxicated, coupling cars—arm pinched above elbow.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Others—Lying, walking, falling, or being on track ..... 1

## PERSONS INJURED—CAUSES.

Employees—Coupling, or caught between cars and engine..... 1

## RECAPITULATION.

Killed—Others—trespassing, on track, etc ..... 1  
Injured—Employees—misconduct or want of caution..... 1

*State of Ohio, County of Paulding, ss.:*

Personally appeared before me, a Justice of the Peace, S. Frank Eagle, President of the Paulding & Cecil Railway Company, and being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

S. FRANK EAGLE,

[SEAL OF R. R.]

President.

Subscribed and sworn to before me, this 10th day of August, A. D. 1881.

JAMES F. LATIMORE,

[SEAL.]

Justice of the Peace.

PITTSBURGH, CINCINNATI AND ST. LOUIS RAILWAY  
COMPANY.

Name of road : Pittsburgh, Cincinnati and St. Louis Railway.  
By whom owned : Pittsburgh, Cincinnati and St. Louis Railway Company.  
By whom operated : Pittsburgh, Cincinnati and St. Louis Railway Company.  
By what authority : Charter.  
Name of Company making this report : Pittsburgh, Cincinnati and St. Louis  
Railway Company.  
General office at corner Pennsylvania and 10th streets, Pittsburgh, Pa.  
Principal office in Ohio at Columbus.  
Address correspondence relating to this report to John W. Renner, Auditor,  
Pittsburgh, Pa.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Geo. B. Roberts .....	President.....	Philadelphia .....	.....
J. N. McCullough.....	1st Vice President .....	Pittsburgh .....	.....
Wm. Thaw .....	2nd " .....	" .....	.....
Thos. D. Messler .....	3d Vice Pres't and Comp- troller .....	" .....	.....
Jno. E. Davidson.....	Ass't Comptroller.....	" .....	.....
M. C. Spencer .....	Treasurer .....	" .....	.....
J. W. Renner.....	Auditor.....	" .....	.....
D. W. Caldwell.....	General Manager.....	" .....	.....
S. B. Liggett.....	Secretary .....	" .....	.....
S. W. White .....	Ass't Secretary .....	Philadelphia .....	.....
M. J. Becker.....	Chief Engineer .....	Pittsburgh .....	.....
E. A. Ford .....	Gen'l Passenger Agent.....	" .....	.....
Wm. Stewart.....	General Freight Agent.....	" .....	.....
F. H. Kingsbury.....	Ass't Gen'l Freight Agent..	Columbus, Ohio.....	.....
J. N. McCullough.....	Executive Committee..	Pittsburgh .....	.....
Wm. Thaw .....		" .....	.....
Thos. D. Messler .....		" .....	.....
Jno. P. Green .....		Philadelphia .....	.....
Wm. H. Barnes .....		Pittsburgh .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Geo. B. Roberts .....	Philadelphia ...	J. P. Wetherill .....	Philadelphia.
J. N. McCullough .....	Pittsburgh .....	Wm. H. Barnes .....	Pittsburgh.
Wm. Thaw .....	" .....	D. S. Gray .....	Columbus, O.
Thos. D. Messler .....	" .....	R. Sherrard, Jr. ....	Steubenville, O.
Henry H. Houston .....	Philadelphia ...	A. J. Cassatt .....	Philadelphia.
Wistar Morris .....	" .....	Jno. P. Green .....	"
J. N. DuBarry .....	" .....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$7,000,000 00	
1st preferred .....	3,000,000 00	
2d preferred .....	3,500,000 00	
Total .....		\$13,500,000 00
Number of shares—common .....	140,000	
1st preferred .....	60,000	
2d preferred .....	70,000	
Total .....		270,000
Par value of each—common .....		\$50 00
1st preferred .....		50 00
2d preferred .....		50 00
Capital stock authorized by vote of Company—common .....		\$13,500,000 00
preferred .....		
Amount subscribed—common .....	\$2,508,000 00	
1st preferred .....	2,929,200 00	
2d preferred .....	3,000,000 00	
Total .....		8,437,200 00
Total paid in capital stock—common .....	\$2,508,000 00	
1st preferred .....	2,920,200 00	
2d preferred .....	3,000,000 00	
Total .....		8,437,200 00
Average amount paid in per mile of single main track (200 miles) .....		42,186 00
Proportion of same for Ohio (158.71 miles) .....		6,695,340 06
Stockholders, residents of Ohio, 100.		
Amount of stock held by them June 30, 1881, 9,421 shares, @ \$50, \$471,050.		
Agents authorized to transfer stock: S. B. Liggett, Secretary, corner Pennsylvania and 10th streets, Pittsburgh, Pa.		
Number of shares transferred within the year at such agencies, 4,592.		

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
P., C. & St. L. R'y Co. 1st mortgage consol. bonds....	1st mortgage on road between South Pittsburgh and Steubenville, O., and 2d mortgage on road betw'n Steubenville and Newark, and undivided half of road betw'n Newark and Columbus .....	Aug. 1, 1868	Aug. 1, 1900	7	\$10,000,000 00	\$6,863,000 00
P., C. & St. L. R'y Co. 2d mortgage bonds .....	2d mortgage on road between South Pittsburgh and Steubenville, O., and 3d mortgage on road betw'n Steubenville and Newark, and undivided half of road betw'n Newark and Columbus, O. ....	Apr. 1, 1873	April 1, 1193	7	5,000,000 00	2,500,000 00
Steubenville and Indiana R. R. Co. 1st mortgage bonds .....	1st mortgage on road betw'n Steubenville and Newark .....	Jan. 1, 1864	Jan'y 1, 1884	6	3,000,000 00	3,000,000 00
Columbus & Newark Div. bonds..	1st mortgage on undivided half of road betw'n Newark and Columbus, O. ....	Apr. 1, 1864	Jan. 1, 1890	7	775,000 00	134,000 00
Holliday's Cove R. R. Co. first mortgage bonds	1st mortgage on road betw'n State line of Pennsylvania and West Virginia and west end of Steubenville bridge.....	Feb. 2, 1863	Feb'y 1, 1893	6	300,000 00	120,000 00
Total .....						\$12,617,000 00

Average amount per mile of single main track (200 miles).....	\$63,085 00
Proportion of same for Ohio (158.71 miles) .....	10,012,220 35
Increase since June 30, 1880.....	120,000 00

## OTHER INDEBTEDNESS.

Deferred debt .....	\$1,153,688 79
All other debts, current credit balances, etc.: current liabilities.....	1,078,318 10
Total unfunded debt.....	\$2,229,006 89
Cash securities, debit balances, etc., available to paym't..	1,513,942 45
Net unfunded debt, including deferred debt, as above.....	\$715,064 44

Total net debt liabilities.....		13,332,064	44
Average amount per mile of single main track.....	\$66,660	32	
Proportion of same for Ohio.....	10,579,659	38	
Total of paid in stock and debt.....		21,769,264	44
Total average amount per mile .....	\$108,846	32	
Proportion of same for Ohio.....	17,274,999	44	

## COST OF ROAD EQUIPMENT, Etc.

Expenditures prior to July 1, 1880 .....	\$16,034,263	85	
Expenditures for the year ending June 30, 1880—Gould tunnel .....		7,478	28
Total expenditures for construction.....	\$16,041,742	13	
Average cost per mile of road constructed (single main track, 214.09 mi.) .....		74,929	90
Average cost per mile of road owned by company (single main track, (214.09 miles) .....		74,929	90
Proportion of same for Ohio (158.71 miles) .....		11,892,124	43

## COST OF EQUIPMENT OWNED BY COMPANY.

Total cost of railroad equipment owned by company, as per last report .....	\$3,908,030	96	
Average amount per mile (of single main track, 214.09 miles) .....		18,254	15
Proportion for Ohio (158.71 miles).....		2,897,116	15
Total for road and equipment .....		19,949,773	09
Total average amount per mile (of single main track, 214.09 miles).....		93,184	05
Proportion of same for Ohio (158.71 miles) .....		14,789,240	58

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—South Pittsburgh, Pa., to Newark, O.....	158.54 mi.	117.59 mi.
Newark, O., to Columbus, O.....	33.02	33.02
Cadiz Junction to Cadiz, O.....	7.80	7.80
Total single main track.....	199.36	158.41
Double track—South Pittsburgh, Pa., to Noblestown, Pa.....	14.43	
Aggregate of sidings and other tracks.....	55.59	45.17
Total length laid with rail computed as single track.....	269.38	203.58
Laid with steel rail .....	219.41	151.25

Length in Ohio, distributed as follows:

County.	Main track.	Branches.	Sidings, etc.	Total.
Jefferson.....	22.74	.....	6.75	29.49
Harrison.....	24.24	7.80	4.49	36.53
Tuscarawas .....	21.72	.....	7.80	29.52
Coshocton .....	23.26	.....	3.49	26.75
Muskingum .....	14.09	.....	2.70	16.79
Licking .....	32.21	.....	9.67	41.88
Franklin.....	12.35	.....	10.27	22.62
Totals.....	150.61	7.80	45.17	203.58
Steel rail.....	150.61	.....	.64	151.25

LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio.
Monongahela extension of P. R. R. in Pittsburgh, Pa., and branches.....	1.23 miles.	
Union Depot track in Columbus, O.....	.25	.25 miles.
Total single track .....	1.48 miles.	.25 miles.
Total.....	1.48	.25
P., C. & St. L. Railway Company owns an undivided half of the road between New- ark, Ohio, and Columbus, Ohio.		

GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft.9 in.
Grade—Maximum, per mile.....	52 ft.8 in.
Longest maximum.....	2 ft.9 in.
Aggregate length of maximum .....	12 feet.
Curvature—Shortest radius.....	6,038 "
Aggregate length of shortest radius.....	5,640 "
Aggregate length of all curves.....	58.42 mi.
Aggregate length of tangent .....	140.94 mi.
Rail—Iron—On road.....	49.97 mi.
Average weight per yard.....	60 & 64 lbs.
Steel—On road.....	219.41 mi.
Average weight per yard.....	60 & 67 lbs.
Ties—Average number per mile .....	2,640
Number laid during the year (79.434 mi., in Ohio) .....	96,506
Ballasted—On whole line .....	208.2 mi.
In Ohio .....	160.2 mi.
With gravel, 139.7 miles; cinders, 3.5 miles; slag, .5 miles; stone, 64.5 miles.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood.....	22; greatest age....	21 years; aggregate length, ft..	2,744
Iron.....	13; “	9 “	1,844.8
Stone arch	20; “	28 “	2,155.7
Total.....			6,744.3
Trestles—11; greatest age, 6 years; greatest height, 20 ft.; greatest length, 159.6; aggregate length, 514.			
Length of shortest span of truss, 20.6 ft.; of longest, 160.4½ ft.; greatest length of beams between points of support, if not trussed, 15 ft.			
Greatest space between cross ties upon bridges and trestles, 8 inches; length of ties, 10 and 8 feet 6 inches.			
Number of track-stringers, 2 and 4.			
Are all bridges and trestles provided with guard rails? Yes.			
Do all bridges and trestles receive stated examinations? Yes.			
How often? Daily by foreman, monthly by bridge inspector.			
Are the examinations analytical, and are they made by a competent person? Yes.			
Tunnels—Brick, 3; aggregate length, ft.....			3,212
Wood, 2; aggregate length, ft.....			2,245
Total.....			5,457

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line .....	313	263
Kind of fencing, as follows:		
Post and board (average cost per rod, 88 c.) .....	217	197
Rail .....	69	39
Wire (average cost per rod, 77 c.) .....	27	27
Length of road unfenced and reason therefor (owner's duty to maintain fences), 5. Along creeks, channels, etc., (destroyed by floods), and through towns, 6.....		
	24.5	24.5

## CROSSINGS.

What railroads cross your road at grade, in this State, and at what locality?

C., T. V. W. R. y at Edgfield Junction (Urichsville), Ohio.

B. & O. R. R., L. E. Division, at Newark, Ohio.

B. & O. R. R., Straitsville Division, at Newark, Ohio.

Ohio Central R. R. at Granville Station, Ohio.

Marietta and Cleveland R. R. at New Comerstown, Ohio.

Number of crossings of highways at grade in this State without protection.....	212
Number at which there are gates or flagmen.....	2
Number of crossings of highways over railroad.....	10
“ “ “ under railroad.....	5
Number of highway bridges 18 feet above track.....	8
Do all trains stop at R. R. crossings as required by law? Yes.	
Are flagmen stationed at each? Yes.	

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated..... 393.8; in Ohio, 309.8  
 Miles of same owned by railroad company: Owned jointly with Western Union  
 Telegraph Company.

## STATIONS.

Passenger and freight..... 75; in Ohio... 41  
 Number with telegraph communication..... 53; " 29  
 Number of same operated by railroad company..... 53; " 29  
 Is pay received for messages sent over line owned by railroad company? Over all  
 joint wires.

## ROLLING STOCK.

Locomotives.....	98; average weight, lbs.....	70,000
Express and baggage cars.....	22; " .....	30,000
Passenger cars .....	47; " .....	40,000
Postal cars .....	5; " .....	50,000
Freight cars (box and stock) .....	3,363; " .....	20,000
Other cars (gondolas, flats, etc.) .....	363; " .....	15,000

Above includes not owned by company reporting.

Locomotives ..... 6; owned by Pennsylvania Company.  
 Freight cars ..... 2,251; owned by Car Trust.  
 Terms of service: Locomotives, monthly rental 6 % per annum on valuation.  
 Number of locomotives equipped with train brakes, 38.  
 Kind of brake: Westinghouse automatic air brake and driver brakes, etc.  
 Number of cars equipped with train brakes, 74.  
 Kind: Westinghouse automatic air brake.  
 Number of passenger cars with Janney coupler and platform, 74.  
 Method of bridging between passenger cars, when two or more are run in trains:  
 None used with Janney coupler and platform.  
 Are all cars run on this road heated and lighted as prescribed by law? Yes.  
 State methods of heating cars used for the transportation of passengers: Winslow's  
 and Bissell's patent stoves.  
 Means of lighting same: Candles or lamps, with mineral sperm oil.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	32 miles per hour.
Mail and accommodation, .....	20 "
Freight trains, .....	12 "

## EMPLOYES.

Superintendents.....	1
Telegraph operators.....	87
Engineers .....	131



Baggagemen .....	20
Flagmen, switch-tenders and watchmen.....	35
Laborers .....	165
Clerks .....	95
Train dispatchers.....	13
Firemen .....	136
Wipers .....	54
Mechanics .....	355
Conductors.....	120
Brakemen .....	311
Station agents .....	85
Section men.....	477
Other employes .....	940

Total number employed by company in operating line ..... 3,025  
Proportion for Ohio..... 1,968

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams express.

Terms: 40 % of gross receipts, not including oyster business; 70 % of gross receipts from oyster traffic.

Special freight and transportation lines: The through freight cars of the Pennsylvania route, now owned by the Pennsylvania Company under the names of Union Line and National Line. They carry the through freight at current rates, and are paid a commission for obtaining and doing the business.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

## EQUIPMENT AND SUPERSTRUCTURE.

Rails—Iron—Average life in years ....	2
Frogs—Average life in years .....	2.5
Ties—Oak—Average life in years.....	7
Bridges—Wooden—Average life in years .....	15
Piling—Average life in years .....	7
Telegraph poles—Cedar—Average life in years.....	16

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest	Average.
Fare charged per mile—			
For distances less than 8 miles.....	4 Cts.	3 Cts.	02.378
For distances over 8 miles—First class.....	3	2	
Second class.....	2	1	
Emigrant .....	2	1	
Excursion.....	2	1	

Amount charged in addition to regular fares, sleeping or other cars run on your road: For seat, \$1.00; berth, \$2.00; section, \$4.00; state room, \$4.00. These charges vary according to distance.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class.....	.0088 Cts.	.0025 Cts.	.0004 Cts.
Second class.....	.0088	.0020	
Third class.....	.0075	.0015	
Fourth class.....	.0075	.0011	
Fifth class.....	.0063	.0010	
Special class.....	.0038	.0008	

Rate per ton per mile on freight carried less  
• than 30 miles :

First class.....	.1760	.0600	.00805
Second class.....	.1760	.0600	
Third class.....	.1500	.0600	
Fourth class.....	.1500	.0560	
Fifth class.....	.1260	.0560	
Special class.....	.10760	.0380	

Rate per ton per mile on freight carried more  
than 30 miles :

First class.....	.0520	.0500	.00805
Second class.....	.0520	.0400	
Third class.....	.0460	.0300	
Fourth class.....	.0400	.0220	
Fifth class.....	1.0400	.0200	
Special class.....	1.0340	.1600	

Rate per ton per mile for—

Coal—Carried ten miles or more.....	.0500	.0149
Carried less than ten miles.....	.0500	.0500
Pig iron—Carried ten miles or more.....	.0500	.0180
Carried less than ten miles.....	.0500	.0500
Limestone—Carried ten miles or more.....	.0500	.0100
Carried less than ten miles.....	.0500	.0500
Iron ore—Carried ten miles or more.....	.0500	.0160
Carried less than ten miles.....	.0500	.0500
Undres'd stone or lumber—Carried 10 miles or more.....	.0500	.0160
Carried less than 10 mi. ....	.0500	.0500

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length—feet.
No. 36—1 mile west Smithfield...	Single intersection	Iron .....	145 ft. 7 in.
57— $\frac{1}{4}$ " " Mastersville..	Two arches.....	Stone.....	82 ft. 6 in.
71—1 " " Frazeysburg.	Three arches.....	" .....	143 ft.
72— $\frac{1}{4}$ " east of Newark.....	Plate girder.....	Iron .....	72 ft. 10 in.

Fencing in Ohio—Miles of single fence built (average cost per rod 78 $\frac{1}{10}$ c.) .....	12 $\frac{16}{100}$
Ballasting—Miles of main track ballasted with stone, gravel, cinder and slag.....	23 $\frac{38}{100}$ ; in Ohio, 13 $\frac{78}{100}$
Rail laid—Steel, 60 and 67 lbs. per yard—miles of track.....	9 $\frac{40}{100}$ 2 $\frac{47}{100}$
New iron, 60       “       “       “ .....	1 $\frac{70}{100}$ 1 $\frac{79}{100}$
Rerolled iron, 60   “       “       “ .....	3 $\frac{10}{100}$ 2.45
Train mileage—Passenger.....	788,613
Freight .....	2,494,604
Work train.....	98,618
Total.....	3,381,835
Car mileage -Passenger.....	2,532,138
Express and baggage.....	1,933,560
Freight—loaded .....	37,520,297
empty.....	6,094,927
Caboose.....	2,050,987
Construction and other.....	394,472
Total.....	50,526,381
Fuel consumed—Wood, 3,084 $\frac{4}{10}$ cords; coal, 140,001 $\frac{11774}{1000}$ tons; total cost..	\$135,251 18
Losses, etc., paid—On goods and baggage.....	8,418 55
For injuries in Ohio, fatal and non-fatal:	
To passengers.....	\$727 00
To employes .....	1,165 00
Total.....	1,892 00
For animals killed in Ohio:	
Horses, 8.....	\$110 00
Cattle, 43.....	270 00
Sheep, 86.....	20 00
Hogs, 41.....	52 00
Total.....	\$552 00
Amount claimed in litigation, etc., for injuries in Ohio to persons.....	25,000 00

## TRANSPORTATION.

Passengers—Number carried—local .....	810,877
through.....	104,173
	<hr/>
Total.....	915,050
Average number carried in each car per trip.....	14 <sup>40</sup> / <sub>100</sub>
Average number of miles traveled by each.....	39.819

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Articles transported :

EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

### EARNINGS.

Passenger transportation—local .....	\$466,810	29
through .....	397,871	13
Total.....	\$864,681	42

Freight transportation—local.....	\$1,424,623 58
through .....	1,771,965 63
Total .....	3,196,589 21
Mail service .....	162,786 01
Express service.....	76,210 38
Other sources .....	37,583 14
Total earnings of line operated included in this report .....	\$4,337,850 16

OPERATING EXPENSES.

Maintenance of way and structures .....	\$525,588	85
Maintenance of cars.....	382,756	51
Motive power .....	608,746	14
Conducting transportation .....	905,400	86
General expenses, as follows :		
Taxes in Ohio .....	\$32,871	99
West Virginia .....	\$1,933	20
Pennsylvania .....	12,776	88
	—————	14,710 08
Salaries .....	27,541	54
Other general expenses of operating.....	53,944	66
	—————	129,068 27
	—————	
Total operating expenses, being 58.82 per cent. of earnings.....	\$2,551,560	63
Net earnings of 200.84 miles operated.....	1,786,289	53
Rentals paid (for use of road, track, depots, equipment), etc. :		
Rent of Monongahela extension of P. R. R.....	37,500	00
Net income over operating expenses and rents paid.....	1,748,789	53
Percentage of same to capital stock and debt .....	08.033	
Percentage of to total means applied to construction, etc.....	08.766	
Per mile of earnings.....	\$21,598 54; Proport'n for O. (158.66 mi.)	3,426,824 36
operating expenses..	12,704 44; " " "	2,015,686 45
net earnings.....	8,894 10; " " "	1,411,137 91

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Other sources.....	\$813,951 50	
	<u>          </u>	\$2,562,741 03

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$840,310 76	
Interest on car trust, cars, etc.....	175,385 39	
Construction of new work.....	7,478 28	
Loss on C. & M. V. R'y .....	79,085 09	
Loss on L. M. R. R.....	200,440 52	
Loss on St. L., V. & T., H. R. R.....	65,064 36	
Other payments .....	1,194,976 63	
	<hr/>	\$2,562,741 03

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$8,437,200 00	
Funded debt.....	12,617,000 00	
Value of supplies, etc., received from leased lines.....	1,351,979 89	
Amount due other companies.....	356,666 97	
Amount due for current expenditures in June and prior thereto.....	529,863 22	
Miscellaneous .....	188,787 91	
	<hr/>	\$23,481,497 99

## ASSETS.

Cost of P., C. & St. L. R'y, construction and equipment to June 30, 1881.....	\$19,949,773 09	
Supplies on hand for current operations.....	472,266 20	
Cost of additions and improvements to leased roads .....	843,876 18	
Cash on hand .....	164,136 13	
Amount due to station agents and conductors.....	96,673 00	
Amount due by other companies.....	476,670 95	
Miscellaneous.....	1,230,730 07	
Balance .....	247,372 37	
	<hr/>	\$23,481,497 99

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880	Thos. O'Brien	Car repairer	Truck rolling over him	Fracture of right thigh.
2	July 16	H. C. Kusey	Brakeman	Falling off train	Bruised about hips and back.
3	17	Unknown		Walking on track	Struck by engine and killed.
4	30	Geo. Watkins		Lying on track	"
5	Aug. 12	O. N. Good	Insurance agent	Jumping off train in motion	Face somewhat bruised.
6	14	Patrick Calline	Laborer	Rear collision	Received injuries causing death.
7	Sept. 10	Patrick Cahill	Fireman	In collision	Caught between engine and tank—killed.
8	11	Chas. Cunningham		Playing on track	Run over by train and killed.
9	25	Jas. Patton	Farmer	Driving across track	Struck and killed.
10	23	C. A. Geyer	Brakeman	Falling off track	Killed.
11	23	S. S. Campbell		Broken axle	Contusion of hip.
12	23	Mrs. S. S. Campbell		"	Forehead cut and leg sprained.
13	23	J. J. Arbaugh		"	Left hip and rib fractured.
14	23	L. A. Bell		"	Slightly bruised and two fingers cut.
15	23	Maggie Collins		"	Elbow very slightly bruised.
16	23	Mrs. T. A. Reddy		"	Shoulder and knees bruised.
17	23	Mrs. Norman		"	One finger dislocated and otherwise bruised.
18	23	C. R. Tipton		"	Very slightly bruised.
19	23	A. R. McCormick		"	"
20	23	J. D. Brough		"	"
21	23	W. W. Duvall	Conductor	"	Back sprained and bruised.
22	23	W. S. Duvall	Brakeman	"	Head slightly cut; knee sprained.
23	19	G. Gatchell		Coupling cars	Squeezed through breast.
24	19	John Harsh	"	Struck in tunnel	Heat cut.
25	20	Mrs. Susan Johnson		Walking on track	Struck by engine; leg mashed.
26	31	W. R. Devine	Engineer	Engine jumped the track	Considerably bruised.
27	Nov. 11	A. O. Stephens	Conductor	Struck by telegraph pole	Severe contusion of head.
28	26	Geo. M. Beck	"	Falling off track	Two ribs broken
29	27	Edw. Walsh	Brakeman	"	Considerably bruised about head.
30	Dec. 9	John Conley	"	Struck in tunnel	Head slightly cut.
31	11	C. D. Axtell	"	Making coupling	Right leg mashed.
32	13	Virgil Sargeant	"	" (intoxicated)	Right hand bruised.

33	Dec.	19	Wm. H. Lytle .....	Brakeman .....	Making coupling .....	Right arm bruised.
34	1881.	29	Jos. Neiswander .....	" .....	Falling off train .....	Right shoulder dislocated.
35	Jan.	5	Thos. Settles .....	Sec. foreman .....	Hand-car struck by engine .....	Bruised about left hip.
36		13	Thos. Burke .....	Engineer .....	Jumping from engine in collision .....	Head cut and ankles sprained.
37		13	Andrew Strayer .....	Fireman .....	Collision; caught betw'n cab and tank .....	Collar bone and three ribs broken.
38		14	Mrs. John Frankschy .....	" .....	Jumping from train .....	Right arm and head bruised.
39		18	Albert Rollison .....	Fireman .....	Jumping from engine .....	Hips and knees bruised.
40		28	Martin Foley .....	Brakeman .....	Jumping from car .....	Contusion of ankle joint.
41	Feb.	1	A. W. Hall .....	" .....	Falling from car .....	Badly bruised in general.
42		5	Geo. Shafer .....	" .....	Making coupling .....	Right forearm mashed.
43		15	Patrick Harrigan .....	" .....	Falling off car .....	" sprained.
44		21	Frank Dorem .....	" .....	Making coupling .....	Three fingers mashed.
45	M'ch	13	Geo. Hait .....	Shoemaker .....	On track; intoxicated .....	Back and arm bruised.
46		16	Frank Bradfo. d. ....	" .....	Walking on track .....	Struck by engine; killed.
47		17	Mrs. Julian Flory .....	" .....	On track picking coal .....	" .....
48	April	10	Joshua Brown .....	Brakeman .....	Coupling cars .....	Right hand mashed off.
49		14	Harry McConnell .....	" .....	Fell in getting on train .....	Left leg crushed.
50		15	Leonard Pusler .....	Brakeman .....	Fell through car .....	Injured about kidneys and bladder.
51		26	Fred. Goshen .....	" .....	Walking in yard; intoxicated .....	Run over by engine; killed.
52		30	Wm. M. Kneff .....	" .....	Pulling pin .....	Right forearm bruised.
53	May	5	Geo. H. Wells .....	Carpenter .....	Getting on train .....	One leg mashed.
54		6	Lee Miller .....	Laborer .....	Walking on track .....	Struck by engine; leg bruised.
55		6	Clifford Hilton .....	Painter .....	Caught by transfer table .....	Right leg lacerated.
56		20	Sam'l Wheeler .....	Brakeman .....	Caught while pulling pin .....	Mashed through groin; killed.
57		25	Wm. McIntire .....	" .....	Struck by bridge .....	Face cut and bruised.
58	June	2	Wm. Welsh .....	" .....	Fell from train; brake chain broke .....	Back sprained.
59		4	James Owens .....	Laborer .....	Walking on track .....	Struck by engine and killed.



## SUMMARY OF ACCIDENTS.

Persons killed—Causes.	Passengers.	Employees.	Others.	Totals.
Falling or thrown from engine or train.....	.....	1	.....	1
Collisions, and standing on platform of car during same...	.....	2	.....	2
Coupling, or crushed between cars and engine .....	.....	1	.....	1
Riding or driving across track ....	.....	.....	1	1
Lying, walking, falling, or being on track.....	.....	.....	7	7
Totals.....	.....	4	8	12

Persons injured—Causes.	Passengers.	Employees.	Others.	Totals.
Getting on or off engine or train in motion.....	3	1	.....	4
Struck by bridge, chute, or other obstruction.....	.....	4	.....	4
Coupling, or caught between cars and engine.....	.....	8	1	9
Falling or thrown from engine or train.....	.....	6	1	7
Lying, walking, falling, or being on track.....	.....	.....	3	3
Collisions.....	.....	3	.....	3
Engine or train leaving or thrown from track.....	.....	2	.....	2
Broken axles and exploded or capsized engine .....	10	2	.....	12
Breaking of brake rod, chain or wheel in setting .....	.....	1	.....	1
Miscellaneous .....	.....	2	.....	2
Totals.....	13	29	5	47

## RECAPITULATION.

Killed—Employees—from causes beyond their control.....	2
misconduct or want of caution.....	2
Others—At stations and highway crossings.....	1
trespassing, on track, etc. ....	7
Total killed .....	12
Injured—Passengers—from causes beyond their control.....	10
misconduct or want of caution.....	3
Employees—from causes beyond their control.....	8
misconduct or want of caution.....	21
Others—trespassing on track, etc.....	5
Total injured.....	47

## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880.				
2	July 1	Columbus, O.	Freight	Cars dropped too fast	Nine cars slightly damaged.
3	10	Mansfield, Pa.	"	Flagman not back far enough	Engine, caboose & 2 cars damaged
4	16	Columbus, O.	"	Cars dropped too fast	Caboose and 4 cars damaged.
5	17	Edge-field, O.	"	Train breaking	Five cars damaged.
6	Aug. 3	Pittsburgh, Pa.	"	Boilers exploded	No damage except to engine.
7	6	Scio, Ohio.	"	Flagman not back far enough	Engine, caboose & 2 cars damaged
8	14	Steubenville, O.	"	Carelessness	3 engines and caboose damaged ; one man killed.
9	17	No. 24 bridge	"	Axle breaking	Engine damaged.
10	26	No. 17 cut.	Freight & construc'n	Careless running	2 engines and 2 cars damaged.
11	Sept. 3	Wheeling Junc.	Freight	Misplaced switch	Four cars damaged.
12	10	Mingo Junc., O.	"	Overlooking signal	Two engines and four cars damaged ; one man killed.
13	25	Steubenville, O.	"	Train breaking	2 engines and 4 cars damaged.
14	28	Kent's, Ohio	Mixed	Broken axle	One car and one coach damaged ; 12 persons injured.
15	30	Scio, Ohio	Freight	Broken axle	Six cars damaged.
16	Oct. 2	Burgettstown, Pa.	Pass. & Frt.	Absence of signal	Engine, coach and car damaged ; 9 persons injured.
17	4	Alex. Roads, O.	Freight	Fast running	Engine, caboose & 8 cars damaged
18	18	McDonald, Pa.	"	Train breaking	2 cars damaged ; 1 person injured
19	20	Cork Run tunnel	"	Wrong signal	Engine and 7 cars damaged ; 1 person injured.
20	29	Hays Station, Pa.	"	Failure of brakes	Engine and 4 cars damaged.
21	29	Burgettstown, Pa.	Passenger	Wrong signal	2 engines, 1 baggage, 1 express and 1 coach damaged ; 4 persons killed.
22	Nov. 6	Hanover, Ohio	Freight	Axle breaking	Engine damaged.
23	12	Paris Road, Pa.	"	Careless running	Engine, car and caboose damaged
24	11	Oakdale, Pa.	"	"	Four cars damaged.
25	24	Hanlin's, Pa.	"	Axle breaking	Engine damaged.
26	28	Collins's, W. Va.	"	Disobeying orders	2 engines and 3 cars damaged ; 1 person injured.
27	Dec. 4	Union Siding, O.	"	Misplaced switch	Engine and 8 cars damaged.
28	21	Broad-head cut.	"	Falling of rod	Engine damaged.
29	31	Temperanceville.	"	Train breaking	Eight dumps damaged.
30	1881.	No. 4 bridge.	Pass. & Frt.	Disobeying signal	2 engines and 1 coach damaged ; 5 persons injured.
31	Jan. 2	Noblestown, Pa.	Freight	Axle breaking	Engine slightly damaged.
32	10	Camp Hill	"	"	Six cars damaged ; 2 persons injured.
33	13	Phil'a Roads.	"	Careless running	Engine, caboose & 2 cars damaged
34	15	Ingram	"	" flagging	Two engines damaged.
35	19	No. 1 bridge	"	Axle breaking	Engine damaged.
36	30	Bloomfield	"	Careless running	Engine and 1 car damaged.
37	Feb. 4	Dinsmore	"	Conductor's watch	2 engines and 4 cars damaged ; 1 killed, 2 injured.
38	9	Willow Grove	"	Careless running	1 engine and 5 cars damaged.
39	13	Black Lick	"	Oil cellar coming down	1 " 7 "
40	19	Bloomfield	"	Careless running	Caboose and 2 "
41	22	Ingram	"	Bad switch	7 cars off track ; damaged.
42	Mch. 4	Mansfield	"	Careless running	Engine and two cars damaged.
43	11	Hanlin's	"	Bad track	Three cars damaged.
44	13	Monon bridge	"	Wrong order	2 engines and 3 cars damaged ; 2 killed, 2 injured.
45	25	M.C.&C. coalmin's	"	Misplaced switch	Six cars damaged.
46	30	Columbus	"	Poor flagging	Engine and 2 cars damaged.
47	Apr. 3	Newcomerstown.	"	Running switch	Two cars damaged.
48	19	Pittsburgh	"	Track spreading	Five cars off, and damaged.
49	May 7	Collins	"	Careless running	Eight cars slightly damaged.
50	17	Phil'a mines	"	Running over cow	Five cars damaged.
51	June 5	Sheridan	"	Cars running into cars	Track and one car damaged.
52	7	Temperanceville.	"	Falling of rock	Engine
53	9	Burgettstown	"	Careless running	2 engines and 6 cars damaged.
54	19	Pataskala	"	"	1 engine and 4 "

## SUMMARY OF TRAIN ACCIDENTS.

Number :

Accidents causing derailment of trains.....	23
Accidents not resulting in derailment of train.....	6

Collisions—butting.....	10	
crossing.....	1	
rear.....	13	
Total accidents.....		53
Causes of accidents effecting derailment of trains:		
Broken axle.....	6	
Cattle on track.....	1	
Falling mass.....	2	
Loose switch.....	1	
Misplaced switch.....	2	
Spreading of rails.....	1	
Other causes.....	10	
Total.....		23
Causes of collisions:		
Conductor's watch.....	1	
Failure of brakes.....	1	
Misplaced switch.....	1	
Orders—absence of, mistake in, neglect or disobedience to.....	3	
Running carelessly.....	13	
Signals—failure to use, or absence of.....	3	
Other causes.....	2	
Total.....		24
Causes of accidents not resulting in derailment of trains:		
Boiler explosion.....	1	
Broken axle.....	2	
Other causes.....	3	
Total.....		6
Total derailments.....		23
Total collisions.....		24
Total accidents.....		53

*State of Pennsylvania, County of Allegheny, ss.:*

Thos. D. Messler, Third Vice President of the Pittsburgh, Cincinnati and St Louis Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

THOS. D. MESSLER,  
Third Vice President.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 10th day of September, A. D. 1881.

[SEAL]

FRANK SEMPLE,  
Notary Public.

# PITTSBURGH, FT. WAYNE AND CHICAGO RAILWAY COMPANY

Name of road : Pittsburgh, Ft. Wayne and Chicago Railway.

By whom owned : Pittsburgh, Ft. Wayne and Chicago Railway Company.

By whom operated : Pennsylvania Railroad Company.

By what authority : Lease.

Name of person making this report : F. M. Hutchinson, Secretary and Treasurer  
Pittsburgh, Ft. Wayne and Chicago Railway Company.

General office at Pittsburgh, Pa.

Address correspondence relating to this report to F. M. Hutchinson, Secretary  
and Treasurer at Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Louis H. Meyer .....	President .....	New York City .....	\$2,400
F. M. Hutchinson .....	Secretary and Treasurer ...	Pittsburgh, Pa .....	3,000
Total salaries.....	.....	.....	\$5,400

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Louis H. Meyer.....	New York.. ....	Chas. E. Speer .....	Pittsburgh.
Geo. W. Cass.....	" .....	R. A. Springer.....	Cincinnati.
S. J. Tilden.....	" .....	L. B. Harrison .....	" .....
Chas. Lamer.....	" .....	John Sherman .....	Mansfield, O.
Geo. B. Roberts.....	Philadelphia....	Pliney Hoagland .....	Ft. Wayne, Ind.
Jno N. Hutchinson .....	" .....	Jesse S. Williams.....	" .....
J. N. McCullough.....	Pittsburgh.		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Regulated by charter, with power to increase from time to time.

Amount—common .....	\$6,500,000 00
Number of shares—common .....	65,000
Par value of each—common .....	\$100 00
Increase since June 30, 1880—common.....	928,000 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$13,214,285 71
guaranteed special.....	7,698,900 00
Total .....	\$20,913,185 71
Amount subscribed—common.....	\$19,714,285 71
guaranteed special.....	7,698,900 00
Total.....	27,413,185 71
Total paid in capital stock—common.....	\$19,714,285 71
guaranteed special.....	7,698,900 00
Total .....	27,413,185 71
Increase since June 30, 1880—guaranteed special.....	928,000 00
Average amount paid in per mile of single main track (468.3 miles)....	\$8,537 66
Proportion of same for Ohio (251.7 miles)..	14,733,929 00
Stockholders, residents of Ohio, 152.	
Amount of stock held by them June 30, 1881, \$31,785.00.	
Agents authorized to transfer stock: Winslow Lanier & Co., 24 and 26 Nassau street, New York.	
Number of shares transferred within the year at such agencies, 31,517.	

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
First mortgage.....	1st lien on road	March, 1862	1912	7	\$5,250,000 00	\$5,250,000 00
Second mortgage .....	2d    "	1862	1912	7	5,160,000 00	5,160,000 00
Third mortgage.....	3d    "	1862	1912	7	2,000,000 00	2,000,000 00
Equipment.....		1874	1884	8	1,000,000 00	1,000,000 00
Construction.....		Jan'y, 1857	1887	7	100,000 00	100,000 00
Total.....					\$13,510,000 00	\$13,510,000 00

Average amount per mile of single main track (468.3 miles).....	\$28,849 00
Proportion of same for Ohio (251.7 miles) .....	7,261,300 40
Amount in hands of trustees of sinking fund for redemption.....	3,260,755 70

## OTHER INDEBTEDNESS.

Total of paid in stock and debt.....	\$40,923,185 71
Total average amount per mile .....	87,386 68
Proportion of same for Ohio.....	21,995,229 22

## COST OF ROAD EQUIPMENT, Etc.

## ROAD ACQUIRED BY PURCHASE.

Cost of original purchase .....	\$18,910,000 00
Cost of construction and equipment since purchase, to date of lease....	5,166,221 15
Amount resulting from capitalization of rental at 7 per cent .....	8,214,285 71
Subsequent expenditures for construction and equipment since lease, to July 1, 1880 .....	\$6,770,900 00
Construction during year ending June 30, 1881.....	928,000 00
	<hr/> 7,698,900 00
Total expended for construction and purchase .....	\$39,989,406 86
Average cost per mile of road owned by company (single main track, 468.3 miles).....	85,392 71
Proportion of same for Ohio (251.7 miles).....	21,493,345 50

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Rental from lessee.....	\$2,949,003 00
Interest and dividends on securities.....	23,752 71
Increase of capital stock .....	928,000 00
Income on sinking fund investment.....	182,735 00
	<hr/> \$4,083,490 74

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net).....	\$955,490 00
Dividends, rate 7 per cent. on general stock.....	1,380,000 00
Last dividend declared on general stock: June 30, 1881.	
Dividends, rate 7 per cent. on guaranteed special stock...	490,203 00
Last dividend declared on preferred stock: June 30, 1881.	
Applied to sinking fund.....	104,100 00
Construction of new work and additional real estate.....	928,000 00
Miscellaneous expenses.....	31,236 70
	<hr/> \$3,889,029 70

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Capital stock.....	\$27,413,185 71
Funded debt.....	13,510,000 00
Interest on funded debt—coupons not presented .....	32,231 41

Dividends on stock not called for.....	88,192 25	
Balance to credit of income account.....	3,111,109 52	
		<hr/> \$44,154,718 89

## ASSETS.

Cost of railway, equipment, etc.....	\$39,989,406 86	
Sinking fund, first and second mortgage bonds.....	2,815,497 79	
Supplies transferred to Pennsylvania R. R. Co., lessee, July 1, 1869 .....	468,724 84	
Winslow Lanier & Co. to pay interest and dividends.....	200,769 21	
Miscellaneous securities.....	229,532 16	
Trustees of Sinking Fund—cash to purchase bonds.....	445,257 73	
Cash in hands of Treasurer.....	5,530 12	
		<hr/> \$44,154,718 89

*State of Pennsylvania, County of Allegheny, ss. :*

F. M. Hutchinson, of the Pittsburgh, Fort Wayne and Chicago Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

F. M. HUTCHINSON,

*Officer in charge P., Ft. W. & C. R'y Co.*

Subscribed and sworn to before me, this 31st day of August, A. D. 1881.

Witness my hand and official seal.

[SEAL.]

WM. F. ROBB,

*Com'r for the State of Ohio in Pittsburgh, Pa.*

PENNSYLVANIA COMPANY OPERATING PITTSBURGH, FORT WAYNE AND CHICAGO RAILWAY.

Name of road: Pittsburgh, Fort Wayne and Chicago Railway.  
By whom owned: Pittsburgh, Fort Wayne and Chicago Railway Company.  
By whom operated: Pennsylvania Company.  
By what authority: Lease.  
Name of company making this report: Pennsylvania Company operating P., Ft. W. & C. Railway.  
• General office at Pittsburgh, Pa.  
Address correspondence relating to this report to J. P. Farley, Auditor, Pittsburgh, Pa.

NAME, TITLE, AND ADDRESS OF OFFICERS OF PENNSYLVANIA COMPANY OPERATING.

Name.	Office.	Address.	Salary.
G. B. Roberts.....	President .....	Philadelphia, Pa.....	
J. N. McCullough .....	1st Vice President .....	Pittsburgh, ".....	
Wm. Thaw.....	2d ".....	" ".....	
Thos. D. Messler.....	3d Vice Pres. and Compt'r .....	" ".....	
John E. Davidson .....	Assistant Comptroller .....	" ".....	
S. B. Liggett.....	Secretary .....	" ".....	
S. N. White .....	Assistant Secretary.....	Philadelphia, ".....	
W. H. Barnes .....	Treasurer .....	Pittsburgh, ".....	
J. P. Farley .....	Auditor .....	" ".....	
D. W. Caldwell.....	General Manager.....	" ".....	
Wm. A. Baldwin .....	Manager.....	" ".....	
J. T. Brooks .....	General Counsel.....	" ".....	
F. Slataper .....	Chief Engineer.....	" ".....	
E. A. Ford .....	Gen. Pass'ger & Ticket Agt..	" ".....	
Wm. Stewart.....	General Freight Agent .....	" ".....	
J. N. McCullough.....	Executive Committee {	" ".....	
Wm. Thaw.....		" ".....	
Thos D. Messler .....		" ".....	
Jno. P. Green .....		Philadelphia, Pa .....	
W. H. Barnes .....		Pittsburgh, Pa .....	

DIRECTORS.

Name.	Residence.	Name.	Residence.
George B. Roberts.....	Philadelphia, Pa	Henry M. Phillips .....	Philadelphia, Pa.
J. N. McCullough .....	Pittsburgh, Pa...	J. N. DuBarry .....	"
Wm. Thaw.....	" .....	J. P. Wetherill .....	"
Thos. D. Messler .....	" .....	A. J. Cassatt .....	"
Henry H. Houston.....	Philadelphia, Pa	John P. Green.....	"
Wistar Morris.....	" .....	W. H. Barnes.....	Pittsburgh, Pa.
Sam'l M. Felton.....	" .....		



## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—Pittsburgh to Chicago.....	467.97	251.656
Total single main track.....	467.97	251.656
Double track .....	56.49	
Aggregate of sidings and other tracks .....	173.96	70.061
Total length laid with rail computed as single track .....	698.42	321.717
Laid with steel rail.....	539.7	260.356
Length in Ohio, distributed as follows:		

County.	Main track.	Branches.	Sidings, etc.	Total.
Columbiana .....	23.734		7.458	31.192
Mahoning .....	10.205		5.253	15.458
Stark.....	35.016		13.864	48.880
Wayne.....	30.872		6.319	37.191
Holmes .....	7.154		0.861	8.015
Ashland .....	8.127		1.965	10.092
Richland.....	24.149		5.473	29.622
Crawford.....	20.320		10.352	30.272
Wyandot.....	20.432		4.179	24.411
Hardin.....	20.232		3.674	23.906
Green.....	25.985		6.448	32.343
Van Wert.....	25.580		4.215	29.795
Totals.....	251.656		70.061	321.717
Steel rail.....	251.656		8.7	260.356

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 9 in.
Grade—Maximum, per mile.....	48 feet.
Longest maximum .....	2 miles.
Aggregate length of maximum.....	2 $\frac{1}{2}$ "
Curvature—Shortest radius.....	674.6 feet = 8° 30' curve.
Aggregate length of curve or shortest radius .....	951 feet.
Aggregate length of curve on all radii.....	71.87 miles.
Aggregate length of tangent .....	396 "
Rail—Iron—On road .....	158.7 "
Average weight per yard .....	60 lbs.
Steel—On road.....	539.7 miles.
Average weight per yard.....	60 and 67 lbs.
Ties—Average number per mile.....	2,816
Number laid during the year.....	400,625
Ballasted—On whole line .....	466.19 miles.
In Ohio.....	251.65 "
With limestone, cinders and gravel.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood—10; greatest age, 7 years; aggregate length, 692 ft. 4 in.

Iron—57; greatest age, 18 years; aggregate length, 4,546 ft. 6 in.

Stone arch—24 over 10-foot span; aggregate length, 459 ft.

Pile—6; renewed every 5 years; aggregate length, 200 ft. Total, 5,897 feet 10 inches.

Trestles—5; renewed every 5 years; greatest height, 20 feet; greatest length, 56 ft.; aggregate length, 159½ ft. Iron plate girder, 29 ft.

Length of shortest span of truss, wooden truss, 40½ ft.; of longest, iron truss, 121½ feet; greatest length of beams between points of support, if not trussed, wood, 14 feet; iron, 19 feet.

Greatest space between cross ties upon bridges and trestles, 6 inches; length of ties, 9 feet 6 inches.

Number of track stringers, 2, if iron; 6, if wood.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Once a week by bridge foreman, semi-annually by inspectors.

Are the examinations analytical, and are they made by a competent person? Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio*
Number miles fencing, computed as single line .....	807	488
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.00).....	765	482
Rail (average cost per rod, 50 cts.) .....	20	
Wire (average cost per rod, 90 cts. and \$1.25).....	22	6
Average cost of fencing.....	\$251,938	\$152,818
Average cost of same per road .....	97.7 cts.	97.7 cts.
Length of road unfenced, and the reason therefor.....	51.3 miles.	3 miles.

In Pennsylvania, 488 miles not required to fence. In Ohio, 3 miles, through towns, etc., not requiring fence.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

N. Y., P. & O. R. R. at Leetonia.

C. & P. R. R. at Alliance.

Valley R. R. and Connotton Valley R. R. at Canton.

C., T., V. & W. R'y at Massillon.

C., Mt. V. & D. R. R. at Orrville.

B. & O. and N. Y., P. & O. R. R. at Mansfield.

C., C., C. & I. R'y at Crestline.

Ohio Central R. R. at Bucyrus.

C., S. & C. R. R. at Forest.

D. M. R. R. and L. E. & W. R. R. at Lima.

T., D. & B. R. R. at Delphos.

C., V. W. & M. R. R. at Van Wert.

Number of crossings of highways at grade in this State without protection .....	296
“ “ “ at which there are gates	
or flagmen .....	5
Number of crossings of highways over railroad .....	10
“ highway bridges 18 feet above track .....	10
Do all trains stop at railroad crossings as required by law? Yes.	
Are flagmen stationed at each? Yes.	

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated .....	467.97; in Ohio, 251.653
Miles of same owned by railroad company jointly with the telegraph company .....	467.97; “ 251.653

## STATIONS.

Passenger and freight, where agents are located.....	99; in Ohio, 41
Number with telegraph communication.....	60; “ 31
Number of same operated by railroad company.....	60; “ 31

Is pay received for messages sent over line owned by railroad company? For all, except railroad business.

## ROLLING STOCK.

Locomotives .....	268; Average weight.....	65,370 lbs.
Express and baggage cars 64;	“ .....	29,000 “
Passenger cars .....	153; “ .....	41,000 “
Freight cars.....	8754; “ .....	18,000 “
Other cars.....	136; “ .....	16,000 “

Above includes not owned by company reporting.

Locomotives.....	5; owned by Pennsylvania Company.
Passenger cars.....	1; “ “
Freight cars.....	1099; “ “

## Terms of service:

Locomotives, 6% per annum on valuation.

Freight, cars  $\frac{3}{4}$  cent per mile run.

Number of locomotives equipped with train brakes, 100.

Kind of brake: Westinghouse air brake.

Number of cars equipped with train brakes, 219.

Kind: Westinghouse air brake.

Number of passenger cars with Miller Platform: None.

Method of bridging between passenger cars, when two or more are run in trains:

By close connecting platforms, joined together with the Janney coupler.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: By

Dripps and Spears and Bissells safety stoves.

Means of lighting same: By candles and safety oil lamps.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation.....	20       “
Freight trains .....	15       “

## EMPLOYEES.

Superintendents .....	2
Telegraph operators.....	272
Engineers .....	356
Baggagemen.....	101
Flagmen, switch-tenders and watchmen .....	289
Laborers .....	1,106
Clerks .....	438
Train dispatchers.....	26
Firemen .....	372
Wipers .....	177
Mechanics .....	1,654
Conductors.....	254
Brakemen .....	748
Station Agents .....	102
Section men.....	2,253
Other employees .....	264
Total number employed by company in operating line .....	8,414
Proportion for Ohio.....	2,484

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union Express.

Term: 40% of gross receipts from general merchandise and money business;  
70% of gross receipts from oyster business.

Special freight and transportation lines: None, except Union Line, owned by Pennsylvania Co. operating this railway.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.		Average life in years.	Equipment and superstructure.		Average life in years.
Locomotives	{ Passenger.....	16	Joint fastenings.....		12
	{ Freight.....	15	Frogs.....		1
	{ Passenger.....	12	Ties—Oak .....		6
Cars.....	{ Baggage.....	12	Bridges.....	{ Wooden.....	9
	{ Box .....	10		{ Iron.....	24
	{ Stock .....	10		{ Trestles .....	6
	{ Coal.....	8		{ Piling .....	6
Rails—Steel .....	{ Flat.....	8	Telegraph poles—Cedar and chestnut post, about.....		12
		9	Fence posts .....		8

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles .....	4 Cts	3 Cts.	3½ Cts.
Over 8 miles—First class .....	3	2	2½
Second class.....	2	1	1½
Emigrant.....	2	1	1½
Excursion .....	2	1	1½

Minimum rate, 10 cents.

Amount charged in addition to regular fares, in sleeping or other cars run on your road: For seat, 50 cents; berth, \$2; section, \$4; state room, \$4.

## FREIGHT.

Rate per 100 lbs. per mile when freight weighs less than a ton:

	Highest.	Lowest.	Average.
First class.....	.024 Cts.	.00216 Cts.	.00043 Cts.
Second class.....	.024	.00176	
Third class .....	.024	.00124	
Fourth class.....	.020	.00100	
Fifth class .....	.016	.00076	

Rate per ton per mile an freight carried less than 30 miles:

First class.....	.48	.0517	.00854
Second class.....	.48	.0517	
Third class .....	.48	.0483	
Fourth class.....	.40	.0448	
Fifth class .....	.32	.0414	

Rate per ton per mile on freight carried more than 30 miles:

First class.....	.05	.0432	.00854
Second class.....	.05	.0352	
Third class .....	.0467	.0248	
Fourth class.....	.0433	.0200	
Fifth class .....	.0366	.0152	

Rate per ton per mile for—

Coal—Carried ten miles or more .....	.05	.0144	.00854
carried less than ten miles.....	.18	.0555	
L'ig iron—Carried ten miles or more .....	.05	.0152	
carried less than ten miles.....	.20	.0555	
Limestone—Carried ten miles or more.....	.05	.0144	
carried less than ten miles .....	.18	.0555	
Iron ore—Carried ten miles or more .....	.05	.0144	
carried less than ten miles .....	.18	.0555	
Undr'd stone or lumber—Carried ten miles			
or more.....	.05	.0152	
Undr'd stone or lumber—Carried less than			
ten miles.....	.20	.0555	

Rate per 100 lbs. for loading and unloading, none.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length—feet.
M. P. 108x3102, Little Seppo run	Plate girder, deck .....	Iron..	23 ft. 3½ in.
No. 27, M.P.113x71, Numan's cr'k	" through..	" ..	44 ft.; lattice gird.reb'lt
No. 28, M.P.116x1296,	" " ..	" ..	55 feet.
No. 35½, 135x5193, Apple creek..	" " ..	" ..	34 "
No. 36½, 141x5250 .. .. .	" " ..	" ..	34 "
153x4592, Pnert's run.....	" deck .....	" ..	23 " 3½ inches.
81x3756, Plum run .....	" " ..	" ..	23 " 3 "
No. 25 ( W. Div.), Sandusky river	Pin connected, thr'gh..	" ..	124 "
No. 176 ( W. Div.), Hog creek.....	" " ..	" ..	50 ft.; 9½&74 ft.8 in., 2 sp.
No. 181 ( W.Div.), Auglaize river	Plate girder.....	" ..	67 feet, east span .....
" " " "	Pin con'td thr'gh truss	" ..	103 feet, west span .....

Ballasting—Miles of main track ballasted, 86.34 ; in Ohio, 75.67.

Rail laid—Steel, 60 and 67 lbs. per yard—miles of track, 38.58 ; in Ohio, 15.62.

Train mileage—Passenger..... 1,833,013

Freight ..... 5,773,221

Mixed—Switching—passenger..... 138,788

freight ..... 1,649,850

1,788,638

Construction ..... 366,664

Total..... 9,761,536

Car mileage—Passenger..... 7,441,954

Express and baggage ..... 3,805,537

Freight—loaded..... 90,994,014

empty..... 15,484,340

Caboose..... 5,599,906

Total..... 123,325,751

Fuel consumed—Wood, 16,366 cords ; coal, 243,312 tons. Total cost ..... \$404,026 29

Losses, etc., paid—On goods and baggage ..... 13,035 28

For injuries in Ohio, fatal and non-fatal—

to passengers..... \$190 00

to employes ..... 6,100 00

to others ..... 4,000 00

Total..... \$10,290 00

For animals killed in Ohio :

Horses, 11..... \$720 00

Cattle, 42..... 870 00

Sheep, 23..... 93 00

Hogs, 32..... 140 00

Total..... \$1,823 00

Amount claimed in litigation, etc., for injuries in Ohio to persons ..... 53,000 00

Passenger transportation—local.....	\$1,255,417	84
through .....	1,069,142	70
	<u>          </u>	<u>      </u>
		\$2,324,560 54

Freight transportation—local.....	\$8,129,864 45
through .....	4,804,440 43
	<hr/>
Total .....	7,934,304 88
Mail service.....	154,945 73
Express service .....	141,801 00
Other sources .....	164,049 22
	<hr/>
Total earnings of line operated included in this report.....	\$10,719,661 37

OPERATING EXPENSES.

Maintenance of way and structures.....	\$1,072,347	99
Maintenance of cars .....	697,288	39
Motive power.....	1,654,778	61
Conducting transportation .....	2,024,721	15
General expenses:		
Taxes in Ohio .....	\$131,793	44
Pennsylvania.....	\$23,005	91
Indiana .....	53,293	44
Illinois.....	25,601	81
	<hr/>	101,901 16
Salaries.....	44,478	23
Other general expenses of operating.....	27,793	06
	<hr/>	305,965 89
<hr/>		
Total operating expenses, being 53.68 per cent of earnings .....	5,755,102	03
<hr/>		
Net earnings of 467.97 miles operated.....	\$4,964,559	34
Rentals paid:		
P., Ft. W. & C. R'y Co.....	\$2,968,632	79
Amount paid C. & P. R. R.—Account of division of joint earnings.....	345,449	71
	<hr/>	3,314,082 50
<hr/>		
Net income of operating expenses and rents paid .....	\$1,650,476	84
Percentage of same to capital stock and debt, 4.03.		
Per mile of earnings, \$22,906.72; proportion for Ohio (251.656 miles)...	5,764,613	53
Per mile of operating expenses, \$12,298.01; proportion for Ohio (251.656 miles).....	3,094,868	00
<hr/>		
Per mile of net earnings, \$10,608.71; proportion for Ohio (251.656 mi.)..	2,669,745	53



## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30TH, 1881.

## EASTERN DIVISION.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880.				
2	July 3	Thos. Kearns.....	Coal miner.....	Lying on track drunk—run over.....	Killed.
3	17	John Wilson.....	Unknown.....	Walking on track drunk—run over.....	Leg cut off.
4	29	Frank Baker.....	Trackman.....	Struck by step of car.....	Slight scalp wound.
5	Aug. 2	M. Flynn.....	Unknown.....	Stealing ride—fell from train.....	Leg cut off.
6	6	John Stroughton.....	Tramp.....	".....	Killed.
7	22	M. L. Sowash.....	Unknown.....	Attempting to get on moving train.....	Leg badly crushed.
8	22	James Lyons.....	".....	Stealing ride—jumped from train.....	Leg cut off.
9	29	W. S. Westbrook.....	Fireman.....	Jumped from engine.....	Leg taken off.
10	Sept. 4	John Gambar.....	Unknown.....	Attempting to get on moving train.....	Killed.
11	18	G. Oyster.....	Brakeman.....	Caught while coupling.....	Shoulder broken.
12	19	F. Nowash.....	Unknown.....	Cinder falling from engine.....	Slight scalp wound.
13	23	George Anderson.....	Drover.....	Struck by overhead bridge.....	Bruised about head.
14	30	C. Hazenuth.....	Track man.....	Crossing in front of engine—run over.....	Killed.
15	Oct. 8	Scott Walters.....	".....	Falling from hand-car.....	Leg bruised.
16	9	Byron James.....	Brakeman.....	Struck by overhead bridge.....	Severely cut about head.
17	Nov. 10	John Doyle.....	Unknown.....	Stealing ride—fell from train.....	Died from injuries.
18	11	John Early.....	Brakeman.....	Caught while coupling.....	Arm crushed.
19	19	Thos. Fenton.....	Track man.....	Letting rail fall.....	Collar bone broken.
20	20	Jacob Russell.....	Unknown.....	Walking on track—run over.....	Foot crushed.
21	30	O. W. Arter.....	Brakeman.....	Slipped and fell from car.....	Killed.
22	Dec. 22	J. B. Smith.....	".....	Struck by overhead bridge.....	Back injured.
23	28	A. Dazan.....	Drover.....	Run in.....	Badly cut about head.
24	31	E. Segner.....	Brakeman.....	Caught while coupling.....	Three ribs broken.
25	1881.				Hand crushed.
26	Jan. 13	P. Segner.....	".....	Coupling pin breaking.....	Gut about head.
27	15	M. Young.....	".....	Falling from car.....	Sev'ly br'd about body
28	22	Henry Bond.....	Unknown.....	Attempting to get on moving train.....	Leg broken.
29	25	M. Maloney.....	".....	Stealing ride—caught between cars.....	Heel crushed.
30	March 8	J. Everhart.....	Ty'gr'ph rep'r'm'n	Cross beam flying back.....	Severely cut about face.
		O. Emerson.....	Brakeman.....	Falling from car.....	Bruised about body.

31	8	Wm. Robinson...	Unknown .....	Climbing on cars while shifting .....	Ankle badly bruised.
32	26	Frank Meisel .....	" .....	Attempting to get on moving engine .....	Died from injuries.
33	April 13	Thos. M. Dugan .....	Track watchman .....	Walking on track—struck by engine .....	Killed.
34	16	R. J. Jones .....	Brakeman .....	Struck by overhead bridge .....	Cut about head.
35	23	Chas. Jones .....	Unknown .....	Stealing ride—jumped from train .....	Arm and 2 ribs broken.
36	May 10	Jas. Dick .....	Brakeman .....	Caught while coupling .....	Collar bone broken.
37	20	John Watling .....	Unknown .....	Stealing ride—fell from train .....	Leg cut off.
38	22	M. Young .....	Brakeman .....	Caught while coupling .....	Hand crushed.
39	June 6	Samuel Frye .....	Gravel train man .....	Stealing ride—fell from train .....	Died from injuries.
40	6	Henry Wagner .....	Tramp .....	" .....	Leg cut off.
41	10	Joseph Smith .....	" .....	Stealing ride—fell from train .....	Leg broken.
42	26	J. G. Taylor .....	Brakeman .....	Struck by overhead bridge .....	Cut about face.
43	29	J. Hite .....	" .....	Caught while coupling .....	Arm badly cut.

## WESTERN DIVISION.

1	July 5	C. N. Harbison .....	" .....	Falling off car .....	Fatally injured.
2	17	B. F. Krutch .....	" .....	Attempting to board moving train .....	Killed.
3	Aug. 21	J. Turnock .....	Section laborer .....	Falling off hand-car .....	"
4	22	D. O'Brien .....	" .....	Falling between cars .....	Fatally injured.
5	2	F. Banzelt .....	" .....	Lying on track .....	Killed.
6	2	T. Quackenbush .....	" .....	" .....	"
7	9	Z. Owens .....	" .....	Walking on track .....	"
8	Nov. 26	M. Graffmiller .....	Section laborer .....	Struck by passing train .....	Arm cut off.
9	Dec. 9	J. Kenally .....	Brakeman .....	Coupling cars .....	"
10	Feb'y 13	F. J. Greer .....	" .....	" .....	Leg cut off.
11	May 17	G. Rawlands .....	" .....	Caught between cars and grain chute .....	Killed.
12	June 29	Lacy Flowers .....	" .....	Walking on track .....	"

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Others—Getting on or off engine or train in motion .....	3
Run over in yards, on sidings, or in switching.....	1
Falling or thrown from engine or train.....	2
Struck by bridge, chute or other obstruction.....	1
Lying, walking, falling, or being on track.....	5
Employees—Coupling, or crushed between cars and engine.....	1
Lying, walking, falling, or being on track.....	2
On hand cars, falling from or struck by engine.....	2
Total .....	17

## PERSONS INJURED—CAUSES.

Employees—Getting on or off engine or train in motion .....	1
Struck by bridge, chute, or other obstruction .....	4
On hand car struck by engine .....	1
Miscellaneous.....	2
Breaking of brake rod, chain or wheel in setting.....	1
Coupling, or caught between cars and engine.....	10
Falling or thrown from engine or train .....	4
Others—Lying, walking, falling, or being on track .....	1
Miscellaneous.....	4
Getting on or off engine or train in motion.....	5
Falling or thrown from engine or train.....	3
Passengers—Miscellaneous.....	1
Struck by bridge, chute, or other obstruction .....	1
Total.....	38

## RECAPITULATION.

Killed—Employees—misconduct or want of caution .....	5
Others—stealing rides.....	6
trespassing, on track, etc .....	6
Total killed.....	17
Injured—Passengers—from causes beyond their control.....	1
misconduct or want of caution.....	1
Employees—from causes beyond their control .....	3
misconduct or want of caution.....	20
Others—stealing rides .....	9
trespassing, on track, etc.....	4
Total injured.....	38

TRAIN ACCIDENTS—ENTIRE LINE.  
EASTERN DIVISION.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1880.				
July 5	Quaker Valley.....	Freight .....	Broken axle .....	1 car off track and 2 broken.
7	Spring Mills .....	" .....	Train breaking; parts coming together .....	6 cars off track; badly broken.
R.Aug. 12	Freedom .....	Passenger .....	Misplaced switch .....	2 engines and 4 cars off track and broken.
16	Enon .....	Freight .....	Running into section ahead .....	1 engine and 2 cars broken and 3 cars off track.
18	Ecstasy.....	" .....	Break beam coming down.....	2 cars off track and broken.
29	Leetonia .....	" .....	Running into section ahead.....	1 engine broken and 3 cars off track.
8	Quaker Valley.....	" .....	Broken axle .....	2 cars damaged.
Oct. 4	Wooster .....	" .....	Train breaking; parts coming together .....	1 car off track and broken.
8	Fairview .....	" .....	Broken truck .....	" .....
11	Enon .....	" .....	Broken journal .....	1 engine and 8 cars off track and broken.
22	Alliance.....	" .....	Running into section ahead .....	2 cars off track and broken.
24	Waterford.....	" .....	Switch rail spreading .....	1 car off track and broken.
"	" .....	" .....	Broken wheel.....	2 cars broken.
25	Shreve .....	" .....	Train breaking; parts coming together .....	Engine and caboose broken.
30	Big Prairie .....	" .....	Running into section ahead.....	Engine and 1 car broken.
31	Enon .....	Passenger .....	Switch rail turning.....	3 cars off track.
Nov. 6	Loudonville .....	Freight .....	Car breaking down.....	1 car off track.
9	Salem .....	" .....	Running into section ahead.....	Engine and 2 cars broken.
15	Wooster.....	" .....	Broken journal .....	1 car off track.
21	Freedom .....	" .....	Run into section ahead.....	3 cars off track and 3 broken.
21	Bolesville .....	" .....	Switch rail turning.....	Engine and 4 cars off track.
13	Canton .....	" .....	Train broke and came together .....	2 cars broken.
25	Alliance .....	" .....	Train broke and came together .....	2 cars broken.
28	" .....	" .....	Run into section ahead.....	Engine and 2 cars broken.
1881.				
Jan'y 1	Homewood .....	" .....	Rails spreading .....	9 cars off track.
5	Canton .....	" .....	Broken axle .....	1 car off track.
7	Highland .....	" .....	Misplaced switch .....	Engine and 6 cars off track.
7	" .....	" .....	Running out of siding into side of train .....	3 cars off track and 5 damaged.
12	Massillon.....	" .....		
14	Lakeville .....	" .....		

## TRAIN ACCIDENTS—ENTIRE LINE—Continued.

## EASTERN DIVISION—Continued.

Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1881.				
Jan'y 15	Baden	Freight	Train broke and came together	2 cars broken.
21	Salem	"	Cars climbing rail.	5 cars off track.
Feb. 3	Big Prairie	"	Run into hand car	Front of engine and hand car broken.
5	Buck Hill	"	Broken rail	3 cars off track.
9	Beaver Bridge	"	Ran into section ahead.	Engine and 2 cars broken.
14	Canton	"	Broken brake beam	2 cars off track.
16	Leetonia	Pass'ger and fight	Freight train run into rear of passenger train	Engine and 2 cars off track and broken.
22	Lucas	Freight	Run into section ahead	Engine and 3 cars broken.
27	Canton	"	Broken rail	Engine and 15 cars off track and broken.
March 14	Homewood	"	Switch rails spreading	Engine and 2 cars off track.
15	Emsworth	"	Broken axle	1 car off track.
17	Leedsdale	"	Run into section ahead	Engine and 3 cars broken.
April 18	Leetonia	"	"	1 engine and 2 cars broken.
19	Economy	"	"	Engine and 3 cars off track and 7 cars broken.
24	Loudonville	"	Broken journal	1 car off track and 1 car broken.
30	Palestine	"	Run into section ahead	1 engine and 8 cars off track and broken.
May 4	Shreve	Passenger	Cylinder head blew out	Engine disabled.
31	Emsworth	Freight	Train broke, came together	1 car broken.
June 9	Danascus	"	Track covered with drift wood.	3 cars off track.
9	Orrville	"	Cars climbing rail.	"
12	Beloit	"	Cylinder head blew out	Engine disabled.
17	Smithville	"	Side rod breaking	"
21	Louisville	Passenger	Cylinder head blew out	Engine and 4 cars broken.
22	Newman	Freight	Run into section ahead	2 engines and 8 cars off track and broken.
26	Orrville	"	Collision	Engine and 2 cars broken.
27	Enon	"	Run into section ahead	

## WESTERN DIVISION.

Month	Day	Locality	Freight	Striking against the cars	Damage to track.	Damage to cars.
1880.						
July	12	Chicago	Freight	Striking against the cars	Track spreading	Broke 1 car.
	13	Upper Sandusky	"	Broken axle	Broken axle	Damage to track.
Aug.	5	Warsaw	"	Broken axle	Broken axle	Axle broken.
	11	Selby	"	Broken truck	Misplaced switch	Truck slightly damaged.
	17	Coesal	"	Broke in two	"	2 cars slightly damaged.
	23	Liverpool	"	Failure of operator to deliver orders	"	3 cars badly damaged
	27	Chicago	"	Collision	"	4 cars slightly damaged.
Sept.	4	Sheffield	"	Broken wheel	"	2 engines and 6 cars badly damaged.
	21	Grovertown	"	Broke in two	"	2 engines and 7 cars badly damaged
Oct.	1	Donaldson	"	Broken axle	"	Caboose damaged.
	9	Lima	"	Broke in two	"	3 cars damaged.
	14	Winslow	"	Broke in two	"	4 cars slightly damaged.
Nov.	7	Kirby	"	Collision on crossing	"	3 cars damaged.
Dec.	7	Upper Sandusky	"	Broken rail	"	2 cars damaged.
	19	Warsaw	"	Collision on crossing	"	5 cars off track.
	30	Chicago	"	Broken axle	"	Engine and 1 car damaged.
1881.						
Jan'y	4	Douglass	"	Jumping track	"	No damage.
	23	Wanatah	"	Collision	"	1 car slightly damaged.
	24	Ada	"	Broke in two	"	2 engines slightly damaged.
	24	Selby	"	Broken truck	"	Engine and 1 car slightly damaged.
Feb'y	3	Hamlet	"	Struck team on crossing	"	5 cars slightly damaged.
	7	Douglass	"	Side rod broke	"	Engine pilot damaged.
	14	Hamlet	"	Misplaced switch	"	Engine off track.
	18	Chicago	"	Train broke	"	Engine slightly damaged.
	19	Hobart	"	Collision	"	2 cars and engine damaged.
March	4	Adams	"	Train broke	"	3 cars and engine damaged.
	6	Hamlet	"	Climbing rail	"	2 cars and engine damaged.
	17	Summit	"	Collision	"	2 cars damaged.
	22	Chicago	"	Jumped track	"	"
April	6	Morgan	"	Collision	"	1 car damaged.
May	12	Lima	"	Broken axle beam	"	Demolished caboose.
	12	Columbia	"	Broken axles	"	1 car damaged.
	19	Liverpool	"	Collision	"	Slight damage.
	28	Delphos	"	"	"	2 engines slightly damaged.
June	25	Chicago	"	"	"	1 engine and 1 car damaged.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	44
Accidents not resulting in derailment of train.....	11
Collisions—Butting .....	4
Crossing.....	2
Rear .....	29

Total accidents..... 90

## Causes of accidents effecting derailment of trains:

Broken axle.....	9
Broken car.....	1
Broken rail.....	3
Broken switch-rod.....	1
Broken truck.....	8
Broken wheel.....	2
Misplaced switch.....	4
Spreading of rails.....	6
Unexplained .....	5
Other causes.....	5

Total..... 44

## Causes of collisions:

Carelessness in side tracking.....	1
Fog.....	5
Orders—absence of, mistake in, neglect or disobedience to.....	4
Running carelessly .....	5
Signals—failure to use, or absence of.....	2
Train breaking in two.....	4
Unexplained.....	12
Other causes.....	2

Total ..... 35

## Causes of accidents not resulting in derailment of trains:

Accidental obstruction.....	1
Broken axle.....	2
Cylinder head burst or blown out.....	2
Other causes.....	6

Total..... 11

Total derailments ..... 44

Total collisions..... 35

Total accidents..... 90

*State of Pennsylvania, County of Allegheny, ss.:*

Thos. D. Messler, Third Vice President of the Pennsylvania Company, operating the Pittsburgh, Fort Wayne & Chicago Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

Subscribed and sworn to before me, this 9th day of September, A. D. 1881.

[SEAL.]

THOS. D. MESSLER,

*Third Vice President.*

FRANK SEMPLE,

*Notary Public.*



# PITTSBURGH AND LAKE ERIE RAILROAD COMPANY.

Name of road: Pittsburgh and Lake Erie Railroad.

By whom owned: Pittsburgh and Lake Erie Railroad Company.

By whom operated: Pittsburgh and Lake Erie Railroad Company.

General office at No. 77 Fourth Avenue, Pittsburgh, Pa.

Principal office in Ohio at Youngstown.

Address correspondence relating to this report to A. D. Smith, Auditor, at Pittsburgh, Pa.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary
Jacob Henrici.....	President .....	Economy, Pa.....	.....
James I. Bennett.....	Vice Presidents.....	Pittsburgh, Pa.....	.....
Daria Hostetter.....		" .....	.....
John G. Robinson.....	Secretary .....	" .....	.....
John G. Robinson.....	Treasurer.....	" .....	.....
A. D. Smith .....	Auditor .....	" .....	.....
W. C. Quincy.....	General Manager.....	" .....	.....
R. W. Jones.....	Master of Transportation..	" .....	.....
A. D. Smith .....	General Passenger Agent..	" .....	.....
E. D. Nettleton.....	General Freight Agent...	" .....	.....
Jacob Henrici.....	Executive Committee..	Economy, Pa.....	.....
James I. Bennett.....		Pittsburgh, Pa.....	.....
Daria Hostetter.....		" .....	.....
Wm. M. Lyon.....		" .....	.....
M. W. Watson.....		" .....	.....
John Reeves .....		Beaver Falls, Pa.....	.....
JM. Bailey .....		Pittsburgh, Pa.....	.....
John Dunlap.....		" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Jacob Henrici.....	Economy, Pa...	John Reeves.....	Beaver Falls, Pa.
James I. Bennett.....	Pittsburgh, Pa..	J. M. Schumaker.....	Pittsburgh, Pa.
Daria Hostetter.....	" ..	J. M. Bailey.....	" ..
Wm. M. Lyon.....	" ..	Ralph Bagaley.....	" ..
Herburt DuPuy.....	" ..	J. H. Devereaux.....	Cleveland, O.
M. W. Watson.....	" ..	John Newsell.....	" ..
John Dunlap.....	" ..	A. E. W. Painter.....	Pittsburgh, Pa.

## CAPITAL STOCK.

## Capital stock authorized by law—

Amount—common.....	\$2,050,000 00
Number of shares—common.....	41,000 00
Par value of each—common.....	50 00
Amount subscribed—common.....	2,050,000 00
Total paid in capital stock—common.....	2,037,110 00
Increase since June 30, 1880—common.....	282,155 67
Average amount paid in per mile of single main track (70.35 miles)...	28,956 78
Proportion of same for Ohio (9.2 miles).....	266,402 37

Capital stock issued, and on what account, as follows:

On what account.	Amount of common.
For subscriptions paid in cash.....	\$1,660,610
For services rendered.....	145,000
For original construction.....	231,500
Total.....	\$2,037,110

## FUNDED DEBT.

1. Kind of bond or obligations.	2. When due.	3. Rate of interest.	4. Amount of authorized issue.	5. Amount actually issued.
1st mortgage bonds.....	Jan., 1928..	6	\$2,000,000	\$2,000,000

Average amount per mile of single main track (70.35 miles).....	\$28,429 28
Proportion of same for Ohio (92 miles).....	261,549 37

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate....	\$484,318 68
All other debts, current credit balances, etc., including earnings for year.....	537,824 16
Total unfunded debt.....	1,022,142 84
Cash securities, debit balances, etc., available to payment	163,228 11
Net unfunded debt.....	\$858,914 73
Average amount per mile of single main track ....	\$12,209 16
Proportion of same for Ohio.....	112,324 27
Increase since June 30, 1880.....	1,193 60
Total net debt liabilities.....	2,858,914 73

Average amount per mile of single main track.....	\$40,638 44	
Proportion of same for Ohio.....	373,873 64	
Total of paid in stock and debt.....		4,896,024 73
Total average amount per mile .....	\$69,595 22	
Proportion of same for Ohio.....	640,276 04	

## COST OF ROAD EQUIPMENT, ETC.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1, 1881.
Right of way .....	\$333,365 75	\$67,550 88	\$400,916 63
Civil engineering.....		1,718 10	1,718 10
Grading and masonry.....		79,908 88	79,908 88
Bridges .....		646 78	646 78
Timber and ties .....			
Iron rails, chairs and spikes.....		24,306 58	24,306 58
Fencing .....		164 74	164 74
Passenger and freight stations .....			
Engine and car houses.....	307,711 90	16,392 96	324,104 86
Machine shops, machinery and fixtures...		2,296 08	2,296 08
Telegraph.....	7,682 70		7,682 70
Contingent expenses and items not speci- fied above.....		21,712 40	21,712 40
Original contract—cost of road.....	3,237,129 91		3,237,129 91
Total expenditures for construction...	\$3,885,890 26	\$214,697 40	\$4,100,587 66

## ROAD ACQUIRED BY PURCHASE.

Total expended for construction and purchase .....	\$4,100,587 66
Average cost per mile of road constructed(single main track, 70.35 mi.)..	58,291 22
Proportion of same for Ohio (9.2 miles) .....	536,279 22

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 28 .....	\$219,140 72
First class passenger cars, 18.....	64,568 11
Second class passenger cars, 5.....	8,500 00
Box freight cars, 399.....	217,932 00
Platform cars, 695.....	366,580 97
Baggage cars, 7.....	18,000 00
Mail and express cars, 1 .....	2,500 00
Caboose cars, 11.....	5,500 00
Dump cars, 20.....	9,500 00
Total cost of railroad equipment owned by company.....	\$912,221 80

Additions within the year ending June 30, 1881.....	383,363	17
Average amount per mile.....	12,966	91
Proportion for Ohio.....	119,295	57
Total for road and equipment .....	5,012,809	46
Total average amount per mile.....	71,258	13
Proportion of same for Ohio.....	655,574	79
Total permanent investment .....	5,012,809	46
Proportion for Ohio (9.2 miles) .....	655,574	79
Average per mile (of single main track, 70.35 miles) .....	71,258	13

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Pittsburgh, Pa., to Youngstown, Ohio.....	68.	9.2
New Castle Junction to New Castle.....	2.35	.....
<hr/>		
Total single main track .....	70.35	9.2
Aggregate of sidings and other tracks .....	18.63	2.41
<hr/>		
Total length laid with rail computed as single track.....	88.98	11.61
Laid with steel rail .....	70.35	9.2
Length in Ohio, distributed as follows:		
Mahoning county, main track, 9.2; sidings, etc., 2.41; total, 11.61.	Steel rail, 9.2.	

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4.73 feet.
Grade—Maximum, per mile .....	26 "
Longest maximum .....	6,500 "
Aggregate length of maximum.....	12,300 "
Curvature—Shortest radius .....	955 "
Aggregate length of shortest radii.....	3,821 "
Aggregate length of all radii.....	631,453 "
Aggregate length of tangents.....	248,000 miles.
Rail—Steel—On road.....	70.35 "
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	2,800
Ballasted—On whole line .....	70.35 miles.
In Ohio .....	9.2 "

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Iron, 1; greatest age, 2 years; length, 270 feet.

    Greatest space between cross ties upon bridges and trestles, 8 inches;  
    length of ties, 9 feet.

    Number of track stringers, 2.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Twice each month.

Are the examinations analytical, and are they made by a competent person? Yes.

#### FENCING—AVERAGE AND AGGREGATE COST.

	Whole line.	In Ohio.
Number miles fencing, computed as single line.....	85	11.2
Kind of fencing, as follows:		
Post and board (average cost per rod, \$2.50).....	75	.....
Wire (average cost per rod, \$2.10).....	10	.....
Average cost of fencing.....	\$6,672 00	\$896 00
Average cost of same per rod.....	2 45	2 50
Length of road unfenced, and the reason therefor: Track runs through cities and towns, along rivers, creeks and bluffs, where fencing is unnecessary.....		
	51 miles.	

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Ashtabula, Youngstown & Pittsburgh Railroad at Hazelton.

“ “ Youngstown.

Number of crossings of highways at grade in this State without protection, 12.

Number of crossings of highways at grade in this State at which there are gates or  
flagmen, 5.

Number of crossings of highways over railroad—one at Struthers.

Number of highway bridges 18 feet above track, 1.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

#### STATIONS AND TELEGRAPH.

##### STATIONS.

Passenger and freight .....	48; in Ohio.....	5
Number with telegraph communication.....	14; “ .....	3
Number of same operated by railroad company .....	14; “ .....	3

##### EMPLOYEES.

Telegraph operators .....	18
Engineers .....	54
Baggagemen .....	10
Flagmen, switch-tenders and watchmen .....	10
Laborers .....	59
Clerks .....	67
Train dispatchers.....	3
Firemen .....	74

Wipers.....	23
Mechanics.....	69
Conductors.....	39
Brakemen.....	94
Station agents.....	32
Section men.....	307
Other employes.....	20

Total number employed by company in operating line.....	879
Proportion for Ohio.....	115

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union Express Company.

Terms: \$25 per day, and half the salary of baggage master on train.

## ROLLING STOCK.

Locomotives.....	28; average weight—lbs.....	98,632
Express and baggage cars.....	8; “.....	48,000
Passenger cars.....	23; “.....	48,000
Freight cars.....	1114; “.....	19,000
Other cars (caboose).....	11; “.....	10,000

Number of locomotives equipped with train brakes, 28.

Kind of brake: Westinghouse Automatic.

Number of cars equipped with train brakes, 18.

Kind: Westinghouse Automatic.

Number of passenger cars with “Miller Platform”, 23.

Method of bridging between passenger cars, when two or more are run in trains: All Miller Platforms.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Anthracite coal stoves with hot air flues.

Means of lighting same: Candles and head-light oil—300° fire test.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	28 miles per hour.
Mail and accommodation.....	22 “
Freight trains.....	10 “

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.
Fare charged per mile—For distances less than 8 miles.....	5 Cts.	3 Cts.
Emigrant.....	3	1½

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

First class .....	5
Second class .....	5
Third class.....	5
Fourth class.....	4
Fifth class .....	4

Rate per ton per mile on freight carried less than 30 miles :

First class.....	1.00	.05
Second class.....	1.00	.05
Third class.....	1.00	.05
Fourth class.....	80	.04
Fifth class.....	80	.04

Rate per ton per mile on freight carried more than 30 miles :

First class .....	.05	.04 $\frac{3}{4}$
Second class .....	.05	.04 $\frac{3}{4}$
Third class.....	.05	.04 $\frac{3}{4}$
Fourth class .....	4	.01
Fifth class .....	4	.00 $\frac{3}{4}$

Rate per ton per mile for—

Coal—Carried ten miles or more .....	.04 $\frac{1}{2}$	.00 $\frac{3}{4}$
Pig iron—Carried ten miles or more .....	.06	.01 $\frac{4}{10}$
Limestone—Carried ten miles or more .....	.06	.01 $\frac{4}{10}$
Iron ore—Carried ten miles or more .....	.06	.01 $\frac{4}{10}$
Undressed stone or lumber—Carried ten miles or more .....	.06	.01 $\frac{4}{10}$

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Train Mileage—Passenger ..	266,281	
Freight .....	231,056	
Mixed .....	239,159	
Construction .....	47,482	
Total.....		883,978
Car mileage—Passenger.....	684,193	
Express and baggage.....	58,227	
Freight—loaded.....	5,535,567	
empty.....	2,441,985	
Caboose, included in empty freight.		
Construction and other .....	344,641	
Total.....		9,064,613
Losses, etc., paid—On goods and baggage.....		\$755 57

## TRANSPORTATION.

Passengers—Total number carried.....	346,490
Average number carried in each car per trip .....	33.6
Average number of miles traveled by each .....	18
Total mileage, or number carried one mile .....	6,236,823
Average amount received for each.....	47.7c.
Average amount <i>per mile</i> received for each .....	2.65c.
Freight—Tons carried—local.....	422,585.2
through.....	873,244.9
Total.....	1,295,830.1
Average tons in each loaded car per trip and mile.....	12.5
Total movement, or tons carried one mile .....	69,296,506.2
Average amount received for each ton .....	59.7c.
“ amount <i>per mile</i> received for each ton .....	101c.
“ cost per ton freight per mile.....	0.762c.
“ amount received for each ton through freight.....	52.969
“ amount received for each ton local freight.....	69.75
Articles transported :	Tons. Per cent.
Coal.....	602,398.4 46.5
Stone, lime, sand, etc.....	192,165 14.8
Petroleum .....	930 00.1
Ores.....	201,883.3 15.6
Pig and bloom iron.....	54,853.2 04.2
Manufactured iron .....	141,301.7 10.9
Lumber and other forest products.....	20,037.7 01.6
Grain, flour, and other agricultural products .....	13,923.4 01.
Live stock .....	225.1 .....
Animal products .....	3,343.1 00.3
Manufactures, including agricultural implements .....	20,437.9 01.6
Miscellaneous.....	44,330.9 03.4
Total tonnage yielding revenue .....	1,295,830.1 100.

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30TH

## EARNINGS.

Passenger transportation—local .....	\$127,051 16.
through .....	38,224 65
Total .....	\$165,275 81
Freight transportation—local .....	\$294,650 50
through .....	472,480 17
Total .....	767,130 67
Mail service .....	7,216 88
Express service.....	7,725 00
Other sources .....	686 38
Total earnings of line operated included in this report ...	\$948,034 74



## OPERATING EXPENSES.

Maintenance of way and structures .....	\$76,664	81
Maintenance of cars .....	58,564	83
Motive power.....	112,229	55
Conducting transportation.....	112,479	54
General expenses:		
Taxes in Ohio .....	1,636	26
Pennsylvania.....	9,709	24
Salaries.....	68,707	89
Other general expenses of operating .....	4,345	67
<hr/>		
Total operating expenses, being 46.8 per cent. of earnings .....	\$444,337	79
<hr/>		
Net earnings of 70.35 miles operated.....	\$503,904	95
Rentals paid for use of road, track, depots, equipment, etc.:		
Equipment .....	\$6,233	83
Stations, etc .....	5,617	26
Net income over operating expenses and rents paid .....	492,053	86
Percentage of same to capital stock and debt.....	10	%
Percentage of to total means applied to construction, etc .....	09.8	%
Per mile of earnings . .... \$13,475 97; proportion for Ohio (9.2 mi.)..	\$123,977	92
operating expenses..... 6,313 14; " " " ..	58,080	89
net earnings..... 7,162 83; " " " ..	65,897	03

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock.....	\$282,155	67
Increase of floating debt .....	1,193	60
<hr/>		\$283,349 27

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds.....	\$120,000	00
Interest on floating debt .....	14,221	59
Construction of new work.....	149,127	68
<hr/>		\$283,349 27

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$2,037,110	00
First mortgage bonds.....	2,000,000	00
Real estate mortgage .....	195,843	12
Call loan.....	30,200	00

Equipment notes .....	256,670 68	
Debit balances .....	162,264 54	
Earnings 6 months ending June 30, 1881.....	475,985 78	
Surplus January 1, 1881.....	322,031 98	
	<hr/>	\$5,480,106 10

## ASSETS.

Cost of construction .....	\$3,382,134 13	
Real estate.....	317,536 90	
Right-of-way .....	400,916 63	
Equipment.....	912,221 80	
Supplies (material on hand).....	15,559 72	
Cash in hands of treasurer .....	61,824 38	
Expenses 6 months ending June 30, 1881.....	227,260 78	
Interest on bonds, etc.....	61,436 81	
Credit balances.....	101,214 95	
	<hr/>	\$5,480,106 10

*State of Pennsylvania, County of Allegheny, ss.:*

Personally appeared before me, a Notary Public in and for said county and State, Jacob Henrici, President of the Pittsburgh and Lake Erie Railroad Company, being duly affirmed, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

JACOB HENRICI,

*President P. & L. E. R. R. Co.*

Subscribed and affirmed to before me this 19th day of October, A. D. 1881.

[SEAL.]

W. M. GORMLY,

*Notary Public.*

## ROCKY RIVER RAILROAD.

Name of road: Rocky River Railroad.

By whom owned: Rocky River Railroad Company.

By whom operated: Rocky River Railroad Company.

By what authority: Charter.

Name of person making this report: W. J. Starkweather, Secretary Rocky River Railroad Company.

General office at Cleveland, Ohio.

Principal office in Ohio at Cleveland, Ohio.

Address correspondence relating to this report to W. J. Starkweather, at Cleveland, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Certificate of incorporation was filed with the Secretary of State February 20, 1867 (Record of Corporation No. 4, page 164). The road was constructed from Cleveland to Rocky River, all in Cuyahoga county, and is of the nature of a street railroad, carrying principally passengers, and connecting with a street railroad worked by horse power.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Elias Simms.....	President.....	Cleveland, O.....	
W. J. Starkweather.....	Secretary.....	".....	\$800
George G. Mulhein.....	General Superintendent...	Rocky River.....	840
Total Salaries.....			\$1,640

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Elias Sims.....	Cleveland, O.....	Charles Pease.....	East Rockport.
M. A. Hanna.....	".....	Hiram Barrett.....	Cleveland.
Henry Lower.....	".....	John H. Sargent.....	"
Geo. F. Marshall.....	".....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$80,000 00
Number of shares—common.....	1,600
Par value of each—common .....	\$50

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common.....	\$80,000 00
Amount subscribed—common.....	75,862 75
Total paid in capital stock—common .....	75,862 75
Average amount paid in per mile of single main track (5.53 miles).....	13,718 40
Proportion of same for Ohio (5.53 miles) .....	13,718 40

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For subscriptions paid in cash—Number shares, 1,517; amount of common, \$75,862.75.

Stockholders, residents of Ohio, 36.

Amount of stock held by them June 30, 1881, \$75,862.75.

Agents authorized to transfer stock: W. J. Starkweather, Secretary of company.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Common.....	Trust deed.....	30th day.....	Oct. 1, 1888	8%	\$35,000	\$35,000

Average amount per mile of single main track (5.53 miles) .....	\$6,330 00
Proportion of same for Ohio (5.53 miles).....	6,330 00

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

Right of way .....	\$4,922 47
Civil engineering .....	1,795 29
Grading, masonry, ties and rails.....	86,762 85
Engines and car houses.....	4,937 87
Interest and discount .....	8,545 05
Total expenditures for construction to July 1, 1881 .....	\$106,963 53

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 3 .....	\$14,490 68
First class passenger cars, 6 .....	9,600 00
Platform cars, 2.....	195 96
Total cost of railroad equipment owned by company .....	\$24,286 64
Average amount per mile (of single main track, 5.53 miles) .....	4,391 80
Proportion for Ohio (5.53 miles) .....	4,391 80
Total for road and equipment .....	131,250 17

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Cleveland, O., to Rocky River.....	5.53	All.
Aggregate of sidings and other tracks .....	.36	All.

Total length laid with rail computed as single track ..... 5.89 All.

Length in Ohio, distributed as follows:

Cuyahoga county, main track, 5.53; sidings, etc., .36; total, 5.89.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	56 inches.
Ballasted—In Ohio, all.....	5.53 miles.
With sand and gravel.	

## FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line, whole line, 3.45 miles. Kind of fencing, boards.

Length of road unfenced, and the reason therefor, 4.16; not wanted by owner.

## CROSSINGS.

Number of crossings of highways at grade in this State without protection, 18.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? No.

## STATIONS.

Passenger and freight..... 2; in Ohio, 2

## ROLLING STOCK.

Locomotives.....	3; Average weight, lbs .....	14,000
Passenger cars.....	6; " " .....	18,000
Freight cars.....	2	

Kind of brake: C hand brake.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Coal stoves, well secured.

Means of lighting same: Oil and candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	12 miles per hour.
Freight trains.....	2       "

## EMPLOYEES.

Superintendents .....	1
Engineers .....	3
Laborers .....	5
Conductors .....	1
Brakemen.....	1
Other employes .....	1

Total number employed by Company in operating line ..... 12

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles.....	5c.	1c.	...

## DOINGS OF THE YEAR ENDING JUNE 30.

Fuel consumed—Wood, 252 cords. Total cost, \$861.81.

## TRANSPORTATION.

Passengers—Number carried, local .....	22,584
Average amount received for each .....	5 cents.

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30

## EARNINGS.

Passenger transportation .....	\$11,292 00
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## OPERATING EXPENSES.

Maintenance of way and structures.....	\$1,526 35
Maintenance of cars .....	1,039 76
Motive power .....	861 81
Conducting transportation .....	3,754 31
General expenses:	
Taxes in Ohio.....	291 92
Salaries and office expense .....	818 85
Other general expenses of operating.....	1,156 60

Total operating expenses, being 83 per cent. of earnings..... \$9,449 60

Net earnings of 5.53 miles operated.	
Net income over operating expenses and rents paid.....	\$1,842 40
Percentage of same to capital stock and debt .....	16
Per mile of earnings .....	\$2,041 95
operating expenses .....	1,708 77
net earnings.....	333 18

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$4,288 00
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## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Stock .....	\$75,862 75
Bonds .....	35,000 00
Profit and loss.....	21,618 12
<hr/>	
Total .....	\$132,480 87

## ASSETS.

Construction .....	\$131,377 03
Cash .....	1,103 84
<hr/>	
Total.....	\$132,480 87

*State of Ohio, County of Cuyahoga, ss.:*

Elias Sims, President of the Rocky River Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief:

(Signed)

ELIAS SIMS.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 7th day of November, A. D. 1881.

J. C. Cox,

[SEAL.]

Notary Public.

# SANDUSKY, MANSFIELD & NEWARK RAILROAD COMPANY.

Name of road: The Sandusky, Mansfield & Newark Railroad.

By whom owned: Stockholders.

By whom operated: Baltimore & Ohio Railroad Company.

By what authority: Lease.

Name of person making this report: J. O. Moss.

General office at Sandusky, O.

Principal office in Ohio at Sandusky, O.

Address correspondence relating to this report to J. O. Moss, at Sandusky, O.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

The history of organization is to be found in Wright's Report for 1870.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
John Gardiner .....	President .....	Norwalk, Ohio.....	.....
J. O. Moss.....	Secretary and Treasurer ...	Sandusky, Ohio.....	.....
B. Dunham .....	Gen'l and Traffic Manager	Newark, Ohio.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
A. H. Moss.....	Sandusky .....	John Gardiner.....	Norwalk.
J. O. Moss.....	" .....	E. G. Gardiner.....	" .....
I. B. Sadler.....	" .....	Robert Garrett .....	Baltimore, Md.
A. C. Moss .....	" .....	John King .....	Cincinnati.
E. B. Curtis .....	Mt. Vernon.....		

## CAPITAL STOCK.

### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$1,110,000 00
Par value of each—common.....	50 00
Total paid in capital stock—common.....	1,073,504 00
Increase since June 30, 1880—common.....	928 00



Average amount paid in per mile of single main track, 116.25 miles.		
Proportion of same for Ohio.....	9,234	44
Stockholders, residents of Ohio.....		58
Amount of stock held by them June 30, 1881.....	655,500	00
Agents authorized to transfer stock: Home office, Sandusky, O.		
Number of shares transferred within the year at such agencies: 32.		

## FUNDED DEBT.

Kind of bond or obligations, first or consolidated mortgage; date of issue, July, 1869; when due, July, 1909; rate of interest, 7 per cent.; amount of authorized issue, \$2,325,000; amount actually issued, \$2,300,000.		
Average amount per mile of single main track (116.25 miles).....	\$19,784	94

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$316,000	00
Total of paid in stock and debt. ....	3,689,504	00
Total average amount per mile.....	\$31,734	67

## COST OF ROAD EQUIPMENT, Etc.

## ROAD ACQUIRED BY PURCHASE.

Mansfield and Sandusky City (original cost, \$1,995,000) purchased for..	\$1,206,000	00
Columbus and Lake Erie (original cost, \$1,582,650) purchased for.....	1,130,463	00
Huron and Oxford (original cost, \$418,000) purchased for.....	94,000	00
Subsequent expenditures for construction .....	1,259,041	00
Total expended for construction and purchase .....	\$3,689,504	06

## EQUIPMENT OWNED BY COMPANY.

Twelve locomotives, seventeen first-class and second-class passenger cars, 366 box freight and platform cars, 6 baggage, mail and express cars, 4 caboose cars, 1 director's and superintendent's car. No record of cost.

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio
Single main track, Sandusky to Newark.....	116.25	All.
Total length laid with rail computed as single track.....	70.25	"
Laid with steel rail.....	46.	"

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.
Erie .....	11.80	4.52
Huron .....	22.75	2.11
Richland .....	43.95	6.75
Knox .....	23.45	3.15
Licking .....	14.30	3.15
Totals .....	116.25	19.68

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

### RECEIPTS OTHER THAN EARNINGS.

Increase—capital stock .....	\$928 00	
Increase—income extraordinary .....	47,772 30	
Income on sinking fund investment—rental .....	194,350 00	
		\$243,050 30

### PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$177,675 00	
Dividends on preferred stock .....	32,553 00	
Construction of new work—stock increase .....	928 00	
		211,156 00
		\$31,894 30

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

### LIABILITIES.

Consolidated bonds .....	\$2,300,000 00
Capital stock .....	1,073,504 00
Interest coupons of 1881 .....	102,900 00
Interest coupons previous to 1881 .....	525 00
Profit and loss .....	31,894 30
B. & O.,—under article twelve .....	316,000 00
	\$3,824,823 30

### ASSETS.

Cost at Union Trust Co., N. Y .....	\$101,395 00
Cost at Sandusky .....	30,051 66
Cost at B. & O. ....	85 93
Expenses account .....	2,458 95
Railway property .....	3,374,831 76
Permanent property, B. & O. Co. ....	316,000 00
	\$3,824,823 30

*State of Ohio, County of Erie, ss.:*

J. O. Moss, Treasurer of the Sandusky, Mansfield and Newark Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

J. O. Moss.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 4th day of August, A.D. 1881.

[SEAL.]

S. C. WHEELER,  
*Notary Public.*

# BALTIMORE AND OHIO RAILROAD COMPANY, OPERATING SANDUSKY, MANSFIELD AND NEWARK RAILROAD.

Name of road: Sandusky, Mansfield and Newark Railroad.

By whom owned: Sandusky, Mansfield and Newark Railroad Company.

By whom operated: Baltimore and Ohio Railroad Company.

Name of company making this report: Baltimore and Ohio Railroad Company.

General office at Baltimore, Md.

Principal office in Ohio at Newark, Ohio.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

Given in previous reports.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. H. Ijams .....	Treasurer .....	Baltimore, Md .....	.....
W. T. Thelin .....	Auditor .....	" .....	.....
J. L. Randolph .....	Chief Engineer.....	" .....	.....
C. K. Lord .....	Gen'l Passenger Agent.....	" .....	.....
L. M. Cole .....	Gen'l Ticket Agent .....	.....	.....

## CHARACTERISTICS, Etc.

### LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Sandusky to Newark.....	116.25 miles.	All.
Total single main track .....	116.25 miles.	All.
Aggregate of sidings and other tracks .....	21.73	All.
Total length laid with rail computed as single track...	137.98 miles.	All.
Laid with steel rail.. .....	76.79	All.
Length in Ohio, distributed as follows :		

County.	Main track.	Sidings, etc.	Total.
Erie.....	11.80	5.14	16.94
Huron .....	22.75	2.11	24.86
Richland .....	43.95	8.18	52.13
Knox .....	23.45	3.15	26.60
Licking .....	14.30	3.15	17.45
Totals .....	116.25	21.73	137.98
Steel rail.....	76.79	.....	.....

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft. 8 $\frac{3}{4}$ in.
Grade—Maximum, per mile .....	56 feet.
Longest maximum .....	10,560 "
Aggregate length of maximum .....	10,560 "
Curvature—Shortest radius.....	1,050 "
Aggregate length of shortest radius.....	2,100 "
Aggregate length of all radii.....	128,040 "
Aggregate length of tangent.....	92 miles.
Rail—Iron—On road.....	39.46 miles.
Average weight per yard .....	64 lbs.
Steel—On road .....	76.79 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile.....	3,000
Number laid during the year.....	78,692
Ballasted—On whole line; with gravel, 111.25; stone, 5 miles.....	116.25 miles.
In Ohio.....	All.

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 14; greatest age, 12 years; aggregate length, ft.....	1,876
Iron, 3; greatest age, 10 years; aggregate length, ft.....	506
Total .....	2,382
Trestles—54; greatest age, 8 years; greatest height, 18 feet; greatest length, 222; aggregate length, 3,749.	
Length of shortest span of truss, 25 feet; of longest, 132; greatest length of beams between points of support, if not trussed, 15 ft.	
Greatest space between cross ties upon bridges and trestles, 10 inches; length of ties, 9 ft.	
Number of track-stringers, 1 and 2 on bridges, and 2 on trestles under each rail.	
Are all bridges and trestles provided with guard rails? Partially.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Daily by trackmen, monthly by Superintendent of Bridges.	
Are the examinations analytical, and are they made by a competent person? Yes.	
Fencing—Average and Aggregate Cost.	Whole Line. In Ohio.
Number miles fencing computed as single line.....	228 miles. All.
Kind of fencing, as follows:	
Post and board (average cost per rod, \$1.10).....	170.00
Rail (average cost per rod, 90 cents).....	57.50
Wire (average cost per rod, \$1.10).....	.50
Average cost of fencing (\$1.10 per rod).	
Average cost of same per rod, \$1.10.	
Length of road unfenced, and the reason therefor: 4.5 miles through towns, etc., not requiring fence.	

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Central Ohio Railroad at Newark, Ohio.

Cleveland, Mt. Vernon and Columbus Railroad at Mt. Vernon, Ohio.

New York, Pennsylvania and Ohio Railroad at Mansfield, Ohio.

Pittsburgh, Ft. Wayne and Chicago at Mansfield, Ohio.

Cleveland, Columbus, Cincinnati and Indianapolis Railroad at Shelby, Ohio.

Lake Shore and Michigan Southern Railway at Monroeville, Ohio.

" " " " " one-fourth mile south of Sandusky.

" " " " " Sandusky.

Number of crossings of highways at grade in this State without protection, 149.

" " " over railroad, 3.

" highway bridges 18 feet above track, 3.

Do all trains stop at railroad crossings as required by law? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated—all in Ohio..... 116.25

Miles of same owned by railroad company—all in Ohio ..... 116.25

## STATIONS.

Passenger and freight—all in Ohio..... 26

Number with telegraph communication—all in Ohio..... 14

Number of same operated by railroad company—all in Ohio..... 14

## ROLLING STOCK.

Locomotives ..... 32; average weight, lbs..... 122,032

Rolling stock furnished by B. & O. Railroad.

Number of locomotives equipped with train brakes, 8.

Kind of brake: Loughridge air.

Number of cars equipped with train brakes: All passenger, baggage, express and mail.

Kind: Loughridge air.

Number of passenger cars with "Miller Platform", none; but nearly all have the Janney coupler and platform.

Method of bridging between passenger cars, when two or more are run in trains:

Movable wooden bridges secured by chain are used between cars not equipped with the Janney Coupler.

State methods of heating cars used for transportation of passengers: Bakers' Patent

Heaters and wood stoves with door locks.

Means of lighting same: Mineral sperm oil and candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops..... 33 miles per hour.

Mail and accommodation, ..... 23 "

Freight trains, ..... 12 "

## EMPLOYES.

General Manager, 1 ; Master of Transportation 1 ; 'Master of Road, 1 ; Assistant Master of Road, 1 ; Master of Machinery, 1 .....	5
Telegraph operators .....	20
Engineers .....	33
Baggagemen.....	9
Flagmen, switch-tenders and watchmen .....	26
Laborers .....	134
Clerks .....	36
Train dispatchers.....	1
Firemen .....	36
Wipers.....	11
Mechanics .....	210
Conductors .....	29
Brakemen .....	47
Station agents .....	21
Section men.....	191
Other employees.....	42
Total number employed by company in operating line.....	851
Proportion for Ohio. ....	851

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: B. & O. R. R. runs its own express.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

## EQUIPMENT AND SUPERSTRUCTURE.

Rails—Steel—Average life in years: not used long enough to determine.

Joint fastenings—Same.

Frogs—Average life in years, 3.

Ties—Oak—Average life in years, 6.

Bridges—Wooden—Average life in years, 15.

Telegraph poles—Cedar—Average life in years, 8.

Fence posts—Average life in years, 8.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length.
Shelby Junction.....	Trestle girder .. . .	Wood and iron.....	36 feet.
Mansfield .....	" .....	" .....	36 "
Utica .....	" .....	" .....	36 "
Amanytown .....	" .....	" .....	32 "

Trestles rebuilt in Ohio—Aggregate length, 750 feet.

Fencing in Ohio—Miles of single fence rebuilt (average cost per rod, \$1.10), 2.22.

Ballasting—Miles of main track reballasted, with gravel, 8.15.

Rail laid—Steel, 60 lbs. per yard—miles of track, 35.77.

Train mileage—Passenger .....	232,473
Freight .....	603,047
Construction—Not kept.	

Total.....	835,520
Car mileage—Passenger... ..	738,894
Express, baggage and mail.....	431,156
Freight—loaded.....	8,725,959
empty.....	3,478,002
Construction and other—Not kept.	

Total.....	13,374,011
Fuel consumed—Wood, 945 cords; coal, 47,837 tons; total cost.....	\$55,658 60
Losses, etc., paid—For animals killed in Ohio: 6 sheep .....	12 00

## TRANSPORTATION.

Passengers—Total number carried.....	224,470	
Average number of miles traveled by each.....		42.8
Total mileage, or number carried one mile.....		9,607,316
Average amount received for each.....		88.8 cents.
Average amount <i>per mile</i> received for each .....	2.08	"
Freight—Tons carried, local.....	40,889	
through .....	836,328	
Total .....		877,217

## Articles transported :

	Tons.	Per cent.
Coal .....	233,803	26.65
Stone, lime, sand, etc.....	7,302	00.83
Petroleum .....	1,652	00.19
Ores .....	25,750	02.93
Pig and bloom iron .....	14,639	01.67
Manufactured iron.....	6,308	00.72
Lumber and other forest products.....	70,146	08.00
Grain, flour, and other agricultural products.....	217,450	24.79
Live stock .....	39,415	04.49
Animal products.....	44,847	05.11
Manufactures, including agricultural implements.....	15,073	01.72
Merchandise .....	78,744	08.98
Miscellaneous .....	122,088	13.92
Total tonnage yielding revenue .....	877,217	100



## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30TH.

## EARNINGS.

Passenger transportation—Total .....	\$192,469 29
Freight transportation—Total .....	629,603 51
Mail service.....	23,785 12
Express service.....	33,015 50
<hr/>	
Total earnings of line operated, included in this report.....	\$878,873 42

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$246,695 42
Maintenance of cars .....	63,579 48
Motive power .....	144,832 35
Conducting transportation.....	231,007 18
General expenses:	
Taxes in Ohio .....	\$21,108 20
Other general expenses of operating .....	28,750 54
	<hr/>
	49,858 74

Total operating expenses, being 83.74 per cent. of earnings.....	\$735,973 17
Net earnings of 116½ miles operated .....	142,900 25
Rentals paid, for use of road, track, depots, equipment, etc .....	194,350 00
Net income over operating expenses and rents paid, deficit .....	51,449 75

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880.	August Frick.....	Laborer.....	Struck by engine while removing hand-car from track	Killed.
2	July	C. A. Cheney.....	Brakeman.....	Coupling.....	Foot crushed.
3	15	Unknown.....	Tramp.....	Getting on train in motion.....	Killed.
4	24	F. Winters.....	Citizen.....	Driving across track.....	"
5	Sept.	Mrs. Winters.....	".....	".....	"
5½	17	E. C. Morrison.....	Brakeman.....	Coupling.....	Hand injured.
6	24	L. H. Dean.....	".....	".....	"
7	Oct.	Owen Stanton.....	".....	Fell from train.....	Hip and back injured.
8	3	Martha Dunn.....	Citizen.....	Walking on track.....	Slightly bruised.
9	10	H. F. Gray.....	Brakeman.....	Coupling.....	Hand injured.
10	15	John O'Donald.....	Boy.....	Getting on train in motion.....	Killed.
11	18	Frank Wolfe.....	Brakeman.....	Fell between cars.....	Hand injured.
12	20	Wm. Lape.....	Passenger.....	Fell from train—intoxicated.....	Heel crushed.
13	26	W. L. Clabaugh.....	Brakeman.....	Coupling.....	Hand injured.
14	Nov.	Jos. Richardson.....	Conductor.....	Fell from train.....	Knee
15	18	John Tabler.....	Engineer.....	Engine blew crown sheet down.....	Slightly injured.
16	21	Robert McClure.....	Fireman.....	".....	"
17	21	E. C. Morrison.....	Brakeman.....	".....	"
18	Dec.	Thos. Slick.....	".....	Coupling.....	Hand injured.
19	9	John C. Peterson.....	Laborer.....	Loading ore—ore fell on him.....	Killed.
20	17	Anson Bailey.....	Brakeman.....	Getting on train in motion.....	Foot injured.
21	18	Jas. Morris.....	Citizen.....	Walking on track.....	Body bruised.
22	22	Fred. Dawsey.....	Brakeman.....	Coupling.....	Hand injured.
23	30	John Huffman.....	".....	".....	"
24	1881.	Mrs. E. O. Ells.....	Citizen.....	Driving across track.....	Killed.
25	Jan.	Mrs. E. G. Gontley.....	".....	".....	"
26	8	Wm. Hall.....	Brakeman.....	Coupling.....	Hand injured.
27	14	B. E. Carter.....	".....	".....	"
28	17	Jas. Mahoney.....	Watchman.....	Sitting on track asleep.....	Killed.
29	5	Frank Wolfe.....	Brakeman.....	Coupling.....	Hand injured.
30	Feb.	Jas. Kagey.....	Carpenter.....	Working on wreck—car fell on him.....	Head
31	17	B. E. Carter.....	Brakeman.....	Coupling.....	Two ribs broken.

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881—Continued.

	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
32	Mar. 19	Jas. Reardon .....	Laborer .....	Thrown from train.....	Back broken.
33	25	Jas. W. Fouch.....	Brakeman.....	Caught foot between rails—run over.....	Killed.
34	April 6	John Dennis.....	Citizen.....	Horses frightened by engine.....	Head injured.
35	16	A. R. Lee .....	Brakeman.....	Coupling .....	Body injured slightly.
36	18	J. McLaughlin.....	" .....	" .....	Hand
37	May 4	Miss C. Lovering.....	Citizen .....	Driving across track .....	Died from injuries.
38	4	Miss E. Lovering.....	" .....	" .....	Badly injured.
39	14	S. Deibl .....	" .....	Fell from train—intoxicated.....	Killed.
40	26	I. Mock .....	" .....	Walking on track—partly deaf .....	"
41	June 28	Chas. Morrison .....	Boy-tramp.....	Getting on train in motion .....	Foot crushed.
42	29	D. I. Figler.....	Engineer .....	" .....	Killed.

## SUMMARY OF ACCIDENTS.

Persons killed—causes.	Passengers.	Employees.	Others.	Total.
Getting on or off engine or train in motion.....		1	2	3
Falling or thrown from engine or train.....			1	1
Riding or driving across track .....			5	5
Lying, walking, falling, or being on track.....		1	1	2
On hand cars, falling from or struck by engine .....		1		1
Catching foot in frog or between rails—run over.....		1		1
Miscellaneous .....		1		1
Totals.....		5	9	14

Persons injured—causes.	Passengers.	Employees.	Others.	Total.
Getting on or off engine or train in motion .....		1	1	2
Driving or riding across track.....			1	1
Coupling, or caught between cars and engine.....		14		14
Falling or thrown from engine or train.....	1	4		5
Lying, walking, falling, or being on track.....			2	2
Broken axles and exploded or capsized engine .....		3		3
Miscellaneous .....		1	1	2
Totals.....	1	23	5	29

## RECAPITULATION.

Killed—Employees - from causes beyond their control.....	1
misconduct or want of caution .....	4
Others—at stations and highway crossings .....	5
stealing rides .....	2
trespassing on track, etc .....	2
Total killed .....	14
Injured—Passengers—misconduct or want of caution.....	1
Employees—from causes beyond their control.....	3
misconduct or want of caution .....	20
Others—at stations and highway crossings.....	1
trespassing on track, etc.....	4
Total injured .....	29

## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of Accident.
	1880.				
1	Oct. 22	Spring Mill .....	Freight .....	Collision, rear .....	2 box cars and 1 caboose damaged.
2	Nov. 30	Mt. Vernon .....	" .....	Collision, butting .....	2 engines and 7 box cars damaged.
3	Dec. 19	Louisville .....	" .....	Collision, rear .....	1 engine, 1 oil, 1 dump, 1 caboose, 2 box cars dam'd.
	1881.				
4	Jan. 22	Lexington .....	" .....	Broken wheel .....	1 box car damaged.
5	Mch. 11	Frederick .....	" .....	Broken rail .....	11 box cars damaged.
6	15	Independence .....	" .....	Loose wheel .....	2 box cars damaged.
7	28	Sandusky .....	" .....	Collision, carelessness in side tracking .....	1 engine and 2 stock cars damaged.
8	May 6	Atta .....	Passenger .....	Car jumped track .....	1 combination damaged.
9	26	Newark .....	Freight .....	Cars jumped track .....	1 dump and 1 gondola car damaged.
10	28	Plymouth .....	" .....	Collision, butting .....	2 engines, 3 box and 8 gondola cars damaged.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains .....	5
Collisions—butting .....	2
rear .....	3
Total accidents .....	10

## Causes of accidents effecting derailment of trains:

Broken rail .....	1
Broken wheel .....	1
Other causes .....	3
Total .....	5

## Causes of collisions:

Carelessness in side tracking .....	1
Other causes .....	4
Total .....	5
Total derailments .....	5
Total collisions .....	5
Total accidents .....	10

*State of Ohio, County of Licking, ss. :*

B. Dunham, General Manager of the Sandusky, Mansfield and Newark Railroad, operated by Baltimore and Ohio Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

B. DUNHAM,

[SEAL OF R. R.]

*General Manager.*

Subscribed and sworn to before me, this 8th day of November, A. D. 1881.

EDWARD KIBLER,

[SEAL.]

*Notary Public, Licking County, O.*

## SCIOTO VALLEY RAILWAY COMPANY.

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Name of road: Scioto Valley Railway.

By whom owned: Scioto Valley Railway Company.

By whom operated: Scioto Valley Railway Company.

General office at Columbus, Ohio.

Principal office in Ohio at Columbus, Ohio.

Address correspondence relating to this report to Jas. P. Curry, Auditor, at Columbus, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

This company filed its certificate of incorporation, under the name of "Scioto Valley Railway Company," February 25, 1875, with a capital stock of two million dollars, for the purpose of constructing a railway from the city of Columbus, Ohio, to the city of Portsmouth, Ohio, a distance of one hundred miles, more or less.

The contract for constructing the entire line of railway was made May 19, 1875.

A mortgage of one million three hundred thousand dollars was authorized October 15, 1875.

To change trustees named in said mortgage, a supplemental mortgage was authorized September 4, 1876.

The railway company assumed the operation between Columbus and Chillicothe March 5, 1877, and between its incorporated termini January 1, 1878.

A second mortgage of five hundred thousand dollars was authorized February 18, 1879.

On July 1, 1880, the southern terminus was changed from the "city of Portsmouth" to "a point on the Ohio river, in Lawrence county, Ohio, opposite the city of Ashland, Kentucky," and an extension of the line to that point authorized.

On July 1, 1880, an increase of the capital stock from \$2,000,000 to \$2,500,000 was authorized, in order to extend the line from Portsmouth to the point in Lawrence county, Ohio, stated above.

A consolidation mortgage was created July 1, 1880, under which the

issuance of bonds, to the amount of \$2,100,000, was authorized, to provide for the surrender of outstanding bonds and for purposes needed in its business.

The purchase of all purchases, property, rights of way, contracts, etc., of the Ohio River Railway Company was made July 12, 1880.

An equipment mortgage was created May 1, 1881, authorizing the issuance of bonds to the amount of \$400,000.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Wm. Adams.....	President.....	New York City.....	.....
W. W. Franklin .....	Vice President.....	Columbus, O.....	.....
Jas. P. Curry.....	Secretary.....	".....	.....
Jos. Robinson .....	Treasurer .....	".....	.....
Jas. P. Curry.....	Auditor .....	".....	.....
Jos. Robinson .....	Superintendent.....	".....	.....
Julian Griggs.....	Chief Engineer .....	".....	.....
J. J. Archer.....	General Passenger Agent..	".....	.....
".....	General Freight Agent ..	".....	.....
Wm. Adams.....	} Executive Committee.. {	New York City.....	.....
Horace Porter.....		".....	.....
Daniel B. Safford .....		".....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Wm. Adams.....	New York City..	Jos. Robinson .....	Columbus, O.
E. F. Winslow.....	" ..	F. E. Merrill.....	" ..
Horace Porter.....	" ..	C. O. Hunter .....	" ..
H. K. McHarg.....	" ..	Marcus Boggs.....	Chillicothe, O.
Wm. M. Long.....	" ..	George Davis .....	Portsmouth, O.
Daniel B. Safford.....	" ..	E. J. Winslow .....	Columbus, O.
W. W. Franklin.....	Columbus, O....		

## CAPITAL STOCK.

Capital stock authorized by law—Amount— common.....	\$2,000,000 00
Number of shares—common.....	40,000
Par value of each—common.....	\$50 00
Increase since June 30, 1880—com'n	\$4,050 00
Capital stock authorized by vote of company—	
Amount—common.....	500,000 00
Total paid in capital stock—common	2,084,800 00
Increase since June 30, 1880— "	204,050 00
Average amount paid in per mile of single main track (123.1 miles).....	16,935 82
Proportion of same for Ohio (123.1 miles) .....	2,084,800 00



Capital stock issued, and on what account, as follows:

On what account.	Number shares.	Amount of common.
For subscriptions paid in cash, and contractors' certificates of indebtedness for services rendered.....	6,974	\$348,700
For original construction .....	30,722	1,536,100
For construction on extension of line or branches.....	4,000	200,000
Total.....	41,696	\$2,084,800

Agents authorized to transfer stock: Winslow, Lanier & Co., New York City.

Number of shares transferred within the year at such agencies, 40,235.

### FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
First mortgage .....	Entire property..	Oct. 15, 1875	Jan. 1, 1896	7	\$1,300,000 00	\$1,294,000 00
Second mortgage...	"	Feb. 18, 1879	Apr. 1, 1894	7	500,000 00	283,000 00
Consolidated mort.	"	July 1, 1880	July 1, 1910	7	2,100,000 00	552,800 00
Car Trust cert's.....	Five locomotives and 200 freight cars.....	Mch. 15, 1879	Various dates	8	97,000 00	58,000 00
Total.....						\$2,187,800 00

Average amount per mile of single main track (123.1 miles).....	\$17,772 54
Proportion of same for Ohio (123.1 miles).....	2,187,800 00
Increase since June 30, 1880.....	480,000 00

### OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$177,352 45	
Total unfunded debt.....	177,352 45	
Cash securities, debit balances, etc., available to payment	37,213 31	
Net unfunded debt.....		\$140,139 14
Average amount per mile of single main track.....	\$1,138 42	
Proportion of same for Ohio.....	140,139 14	
Decrease since June 30, 1880.....	12,826 44	
Total net debt liabilities.....		2,327,939 14
Average amount per mile of single main track.....	\$18,910 96	
Proportion of same for Ohio.....	2,327,939 14	
Total of paid in stock and debt.....		4,412,739 14
Total average amount per mile .....	\$35,846 78	
Proportion of same for Ohio .....	4,412,739 14	

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expendi- tures to July 1, 1881.
Bridge and culvert masonry.....		\$7,719 86	
Right of way.....		36,535 98	
Civil engineering.....		8,222 07	
Grading, ballasting and labor laying track.....		92,998 79	
Bridges, superstructure and trestles.....		48,418 47	
Cross ties.....		31,416 33	
Frogs and switches.....		3,400 00	
Iron rails, chairs and spikes.....		145,658 05	
Fencing.....		5,241 18	
Passenger and freight stations.....		187 22	
Engine and car houses.....		10 79	
Machine shops, machinery and fixtures.....		1,956 18	
Other buildings and fixtures.....		3,256 82	
Telegraph.....		1,148 20	
Street and road crossings.....		2,814 43	
Interest and discount.....		229,300 00	
Contingent expenses.....		49,463 91	
Deduct amount recovered from con- tractor for non-fulfillment of contract.....		\$667,748 94 51,390 13	
Total expenditures for construction.....	\$3,288,999 19	\$616,358 81	\$3,905,358 00

Total expended for construction and purchase.....	\$3,905,358 00
Average cost per mile of road constructed, (single main track 123.1 mi).....	31,725 08
Average cost per mile of road owned by company, (single main track 123.1 miles).....	31,725 08
Proportion of same for Ohio (123.1 miles).....	3,905,358 00

## COST OF EQUIPMENT OWNED BY COMPANY.

Total cost of railroad equipment owned by company.....	\$255,886 23
Additions within the year ending June 30, 1881.....	3,283 13
Average amount per mile (of single main track 123.1 miles).....	2,078 69
Proportion of same for Ohio (123.1 miles).....	255,886 23
Total for road and equipment.....	4,161,244 23
Total average amount per mile (of single main track, 123.1 miles).....	33,803 77
Proportion of same for Ohio (123.1 miles).....	4,161,244 23

## COST OF PROPERTY PURCHASED BY COMPANY NOT INCLUDED IN THE FOREGOING ACCOUNTS.

Real estate not included in the foregoing accounts.....	\$40,125 00
Total permanent investment.....	4,201,369 23
Proportion for Ohio (123.1 miles).....	4,201,369 23
Average per mile (of single main track 123.1 miles).....	34,129 72

\* Cannot give items.

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length.	In Ohio
Single main track, Caldwell Junction to Portsmouth Junction.....	97.60	97.60
Sciotoville to Petersburg.....	25.50	25.50
Total single main track.....	123.10	123.10
Aggregate of sidings and other tracks .....	6.42	6.42
Total length laid with rail computed as single track .....	129.52	129.52
Length in Ohio, distributed as follows :		

County.	Main track.	Sidings, etc.	Total.
Franklin.....	12.87	.84	13.71
Pickaway.....	23.47	1.16	24.63
Ross.....	24.86	.95	25.81
Pike.....	19.35	.92	20.27
Scioto.....	31.55	1.82	33.37
Lawrence.....	11.00	.73	11.73
Total.....	123.10	6.42	129.52

## LINE OPERATED UNDER LEASE—EMBRACED IN THIS REPORT.

	Length.	In Ohio
Use tracks of P., C. & St. L. R'y Co. and B. & O. R. R. Co. from Union Depot, Columbus, O., to Caldwell Junction.....	2.30	2.30
Use tracks of M. & C. R. R. Portsmouth Junction to Sciotoville.....	5.50	5.50
Total single track.....	7.80	7.80

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft. 8 $\frac{1}{2}$ in.
Grade—Maximum, per mile.. .....	5,280 feet.
Longest maximum.....	5,300 "
Aggregate length of maximum .....	36,200 "
Curvature—Shortest radius.....	441 "
Aggregate length of shortest radius.....	674 "
Aggregate length of all radii.....	71,730 miles.
Aggregate length of tangent.....	59,195 "
Rail—Iron—On road .....	123.1 "
Average weight per yard.....	50 and 56 lbs.
Ties—Average number per mile .....	2,800
Number laid during the year .....	18,611
Ballasted—On whole line.....	123.1 miles.
In Ohio .....	123.1 "
With stone and gravel.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 8; greatest age, 6 years; aggregate length, 1,766 feet.

Combination, 1; greatest age, 3 years; aggregate length, 465 feet. Total, 2,231.

Trestles—118; greatest age, 5 years; greatest height, 37 feet; greatest length, 2,052 feet; aggregate length, 18,882 feet.

Length of shortest span of truss, 26 feet; of longest, 154 feet; greatest length of beams between points of support, if not trussed, 16 feet.

Greatest space between cross ties upon bridges and trestles, 12 inches; length of ties, 8 feet.

Number of track-stringers: Generally two, but often four.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Not regularly.

How often? Frequently once a month—always every two months.

Are the examinations analytical, and are they made by a competent person? Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole line.	In Ohio.
Number miles fencing, computed as single line, whole line.....	105	105
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.03).		
Wire (average cost per rod, 67½ cents).		
Hedge (average cost per rod, \$1.10).		
Length of road unfenced, and the reason therefor.....	68	68

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Columbus and Hocking Valley Railroad at Nine-Mile Post.

Cincinnati and Muskingum Valley Railroad at Circleville.

Marietta and Cincinnati Railroad at Chillicothe and Sciotoville.

Toledo, Delphos and Burlington Railroad at Chillicothe and Ironton.

Ohio Southern Railroad at Waverly.

Number of crossings of highways at grade in this State without protection, 96.

Number of crossings of highways at grade in this State at which there are gates or flagmen, none.

Number of crossings of highways over railroad, 1.

“ “ “ under railroad, 1.

Number of highway bridges 18 feet above track, 1.

“ “ “ less than 18 feet above track, none.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated, in Ohio.....	130.9; in Ohio, 130.9
Miles of same owned by railroad company, in Ohio .....	none; " none.

## STATIONS.

Passenger and freight, in Ohio .....	42
Number with telegraph communication, in Ohio .....	21
Number of same operated by railroad company, in Ohio.....	21
Is pay received for messages sent over line owned by railroad company? Not owned by company.	

## ROLLING STOCK.

Locomotives .....	13; Average weight.....	60,000 lbs.
Express and baggage cars.....	4; " .....	28,000 "
Passenger cars .....	13; " .....	38,000 "
Parlor and sleeping cars.....	1; " .....	38,000 "
Freight cars.....	444; " .....	18,400 "
Other cars .....	3; " .....	17,000 "

Above includes not owned by company reporting.

5 locomotives, owned by Perkins, Livingston, Post & Co.

200 freight cars, owned by " " "

Number of locomotives equipped with train brakes, 5.

Kind of brake: Westinghouse Automatic.

Number of cars equipped with train brakes, 18.

Kind: Westinghouse Automatic.

Number of passenger cars with "Miller Platform," 13.

Method of bridging between passenger cars, when two or more are run in trains: Miller platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Spear's patent heater.

Means of lighting same: Candles and oil.

## SPEED OF TRAINS.

Express passenger, average rate, including stops.....	25 miles per hour.
Mail and accommodation .....	25 "
Freight trains .....	10 "

## EMPLOYEES.

Superintendents .....	1
Telegraph operators and station agents.....	22
Engineers .....	17
Baggagemen .....	4

Flagmen, switch-tenders and watchmen .....	10
Laborers .....	26
Clerks .....	22
Train dispatchers.....	2
Firemen .....	18
Wipers.....	12
Mechanics .....	89
Conductors.....	14
Brakemen.....	28
Station agents.....	23
Section men.....	175
Other employes .....	63

Total number employed by company in operating line ..... 526

Proportion for Ohio ..... 526

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Adams.

Terms: Thirty-five (35) cents per hundred pounds on a guaranteed weight of four thousand pounds through, per day (working days), and all in excess of that weight to be charged at same rate.

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile:

	Highest.	Lowest.	Average.
	10 Cts.	10 Cts.	10 Cts.
For distances less than 8 miles .....			
For distances over 8 miles—1st class.....	.03	.01½	.02
2d class.....	.02	.01½	.01½
Emigrant.....	.01	.01	.01
Excursion .....	.02	.01	.01

## FREIGHT.

Rate per ton per mile on freight carried less than 30 miles:

	Highest.	Lowest.	Average.
	.05 Cts.	.05 Cts.	.05 Cts.
First class .....			
Second class .....	.05	.05	.05
Third class .....	.05	.05	.05
Fourth class .....	.05	.05	.05
Fifth class.....	.04½	.04	.04
Special class ..	.04	.03	.02½

Rate per ton per mile on freight carried more than 30 miles:

	.05	.04	.04½
First class .....			
Second class .....	.04½	.04	.04
Third class .....	.04	.03	.03
Fourth class .....	.03½	.02½	.02
Fifth class.....	.03	.02	.01
Special class.....	.03	.00¾	.00½

## Rate per ton per mile for—

Coal—Carried 10 miles or more .....	.01½	.00¾	.00½
Carried less than 10 miles.....	.03	.02	.01½
Pig iron—Carried 10 miles or more .....	.01	.00½	.00¾
Carried less than 10 miles.....	.03	.02	.02½
Iron Ore—Carried ten miles or more.....	.00¾	.00¾	.00¾
Undressed stone or lumber—Carried 10 miles or more	.01½	.00¾	.00½
Carried less than 10 miles .....	.03	.02	.01½

## DOINGS OF THE YEAR ENDING JUNE 30TH.

## Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length—feet.
Little Scioto River.....	Howe Truss.....	Wood.....	165
Pine Creek.....	“ .....	“ .....	100

Trestles built in Ohio—39 ; aggregate length.....	6,822 feet.
Fencing in Ohio—Miles of single fence built.....	18.5
Grading—Miles of main track graded.....	25.5 ; in Ohio, 25.5
Ballasting—Miles of main track ballasted with stone, cinders and gravel.....	25.5 25.5
Rail laid—New iron, 56 lbs. per yard—miles of track.....	25.5 25.5
Train mileage—Passenger.....	143,182
Freight .....	168,240
Construction .....	24,679
Total.....	336,101
Car mileage—Passenger.....	444,224
Express and baggage.....	137,349
Freight—loaded .....	1,189,030
empty.....	438,070
Caboose.....	121,882
Construction and other.....	172,753
Total.....	2,503,308
Fuel consumed—Wood, 247 cords ; coal, 10,293 tons ; total cost.....	\$15,733 54
Losses, etc., paid—On goods and baggage.....	945 65
For injuries in Ohio, fatal and non-fatal :	
To passengers.....	\$115 00
To employes .....	142 30
Total.....	257 30

## 1277

Horse, 1.....	\$20 00
Mule, 1.....	50 00
Cattle, 2.....	50 00

Total.....	\$120 00
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Passengers—Number carried, local .....	164,155
through .....	<u>16,416</u>
Total .....	180,571
Average number of miles traveled by each.....	30.63
Total mileage, or number carried one mile.....	5,530,889
Average amount received for each.....	74 cts.
Average amount <i>per mile</i> received for each .....	02.41 cts.
Freight—Tons carried, local.....	187,285
through .....	<u>33,247</u>
Total.....	220,532
Total movement, or tons carried one mile.....	11,799,370
Average amount received for each ton.....	85.14 cts.
Average amount <i>per mile</i> received for each ton .....	01.59 cts.
Average cost per ton freight per mile.....	01.10 cts.
Average amount received for each ton through freight .....	51.97 cts.
Average amount received for each ton local freight.....	91.04 cts.

	Tons.	Per cent.
Coal.....	24,048	10.90
Stone, lime, sand, etc.....	4,374	1.98
Ores.....	10,400	4.72
Pig and bloom iron.....	14,005	6.35
Manufactured iron.....	11,222	5.08
Lumber and other forest products.....	49,461	22.41
Grain, flour, and other agricultural products.....	63,154	29.04
Live stock.....	2,712	1.22
Animal products.....	3,669	1.66
Manufactures, including agricultural implements.....	17,562	7.63
Merchandise.....	17,595	7.97
Miscellaneous.....	2,330	1.04
Total tonnage yielding revenue.....	220,532	100

## EARNINGS.

Passenger transportation—local.....	\$118,769 63
through.....	15,053 42
Total.....	<u>\$133,823 05</u>





## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds, (net).....	\$130,870 64	
Interest on floating debt.....	1,779 34	
Bonds of Company canceled (par value).....	41,000 00	
Floating debt liquidated.....	12,826 44	
Construction of new work.....	616,358 81	
Additional equipment.....	3,283 13	
Additional real estate.....	6,125 00	
Car Trust certificates redeemed.....	18,000 00	
Interest on Car Trust certificates .....	5,680 00	
Increase of material on hand.....	5,975 62	
Other payments.....	23,735 03	
	<hr/>	\$865,634 01

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$2,084,800 00	
Funded debt.....	2,187,800 00	
Interest on car trust certificates .....	8,120 00	
Subscription account.....	775 00	
Bills payable .....	7,868 53	
Accounts payable .....	90,437 19	
Due to other railroad companies.....	9,865 69	
Interest coupons maturing July 1, 1881 .....	64,610 00	
Interest coupons maturing prior to July 1, 1881, and un- paid .....	700 00	
Miscellaneous .....	3,871 04	
	<hr/>	\$4,458,847 45

## ASSETS.

Cost of road equipment, etc.....	\$4,201,369 23	
Leased equipment.....	133,462 61	
Contractors' certificates of indebtedness.....	5,170 75	
Suspended account.....	726 00	
Sinking funds .....	757 64	
Due from agents and conductors .....	4,342 77	
"    U. S. P. O. Department.....	2,187 97	
"    other railroad companies.....	6,082 15	
"    miscellaneous sources .....	16,439 87	
Cash in hands of Treasurer .....	9,793 60	
"    "    Winslow, Lanier & Co.....	701 38	
Cash remitted by agents and in transit .....	11,668 10	
Insurance .....	642 50	
Material on hand.....	13,800 79	
Income account .....	51,702 09	
	<hr/>	\$4,458,847 45



SUMMARY OF ACCIDENTS.

PERSONS KILLED—CAUSES.

Others—Lying, walking, falling, or being on track .....	2
Total .....	2

PERSONS INJURED—CAUSES.

Passengers—Getting on or off engine or train in motion .....	3
Others—Driving or riding across track .....	1
Lying, walking, falling, or being on track .....	2
Employees—Coupling, or caught between cars and engine.....	3
Total .....	9

RECAPITULATION.

Killed—Others—trespassing, on track, etc .....	2
Total killed .....	2
Injured—Passengers—misconduct or want of caution.....	3
Employees—misconduct or want of caution.....	3
Others—trespassing on track, etc.....	3
Total injured.....	9

TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train.	Cause of accident.	Effect of accident.
1	1880. Aug. 20	Johnson's .....	Freight .....	Track washed out .....	Delay to other trains; no damage done.
2	30	Near Lucasville..	Passenger..	Culvert washed out ...	Baggage car and 2 coaches thrown on side; damage small.
3	1881. April 27	Friend street, Columbus, O.....	Freight.....	Stone in flange at street crossing .....	Engine thrown off track; damage slight.

State of Ohio, County of Franklin, ss.:

Joseph Robinson, Superintendent and Treasurer of the Scioto Valley Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

Subscribed and sworn to before me, this 20th day of December, A. D. 1881.

J. ROBINSON,  
*Superintendent and Treasurer.*

ROBERT CASTLE,  
*Notary Public, Franklin Co., O.*

[SEAL.]

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R.R.C.

# SPRINGFIELD SOUTHERN RAILROAD COMPANY.

*From June 30, 1880, to March 1, 1881.*

Name of road: Springfield Southern Railroad.

By whom owned: Springfield Southern Railroad Company.

By whom operated: Springfield Southern Railroad Company.

Name of person making this report: Amos Whitely, Treasurer Springfield Southern Railroad Company.

General office at Springfield, O.

Principal office in Ohio at Springfield, O.

Address correspondence relating to this report to Amos Whitely, Treasurer, at Springfield, Ohio.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
W. A. Whiteley .....	President .....	Springfield, O. ....	.....
H. L. Chapman .....	Vice-President .....	Jackson, O. ....	.....
Geo. A. Barnes .....	Secretary .....	Springfield, O. ....	\$1,000
Amos Whiteley .....	Treasurer .....	" .....	.....
W. Thornburgh .....	General Superintendent...	" .....	2,400
W. Harvy .....	Chief Engineer .....	" .....	1,200
Amos Whiteley .....	General Passenger Agent..	" .....	.....
W. F. Harris .....	General Freight Agent .....	" .....	1,000
Amos Whitely .....	General Ticket Agent .....	" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
W. A. Whiteley .....	Springfield, O. ....	Amos Whiteley .....	Springfield, O. ....
B. H. Warder .....	" .....	Jerome Fassler .....	" .....
A. S. Bushnell .....	" .....	O. S. Kelly .....	" .....
Geo. H. Frey .....	" .....	H. L. Chapman .....	Jackson, O. ....

## CAPITAL STOCK.

Capital stock authorized by law—Amount—common .....	\$1,000,000 00
Number of shares—common .....	20,000
Par value of each—common .....	\$50 00

Capital stock authorized by vote of Company—common .....	525,500 00
Amount subscribed—common.....	525,500 00
Total paid in capital stock—common.....	525,500 00
Average amount paid in per mile of single main track (113.42 miles)...	4,633 22
Proportion of same for Ohio (113.42 miles).....	All.

CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For subscription paid in municipal, county or town bonds—No. shares, 10,510;  
amount of common, \$525,500.  
Stockholders, residents of Ohio, 8.  
Amount of stock held by them April 1, 1881, \$525,500.  
Agents authorized to transfer stock: Geo. A. Barnes, Secretary, Springfield, O.

FUNDED DEBT.

1. Kind of bond or obli- gations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of in- terest.	6. Amount of author- ized issue.	7. Amount actually issued.
1st mortgage..	Road & equipment	Jan. 1880	5, 10, 15 or 20 years	7	\$1,300,000	\$583,200

Average amount per mile of single main track (113.42 miles), \$5,141.95.  
Proportion of same for Ohio, all.  
Increase since June 30, 1880, \$383,200.

OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$167,549 14	
All other debts, current credit balances, etc.....	94,834 55	
Total unfunded debt.....	262,383 69	
Cash securities, debit balances, etc., available to payment	85,787 20	
Net unfunded debt .....		\$176,596 49
Average amount per mile of single main track.....	\$1,577 00.	
Proportion of same for Ohio .....	All.	
Decrease since June 30, 1880 .....	193,652 74	
Total net debt liabilities.....		759,796 49
Average amount per mile of single main track .....	\$6,698 96	
Proportion of same for Ohio.....	All.	
Total of paid in stock and debt .....		1,285,296 49
Total average amount per mile .....	\$11,332 18	
Proportion of same for Ohio.....	All.	

## COST OF ROAD EQUIPMENT, ETC.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1, 1881.
Right of way .....	\$61,975 86	\$3,986 40	\$65,962 26
Civil engineering .....	255 75	687 87	943 62
Grading and masonry .....	226,929 28	14,655 36	241,584 64
Bridges .....	42,284 43	3,441 55	45,725 98
Timber and ties .....	127,915 32	16,644 92	144,560 24
Superstructure .....	29,853 83	7,115 65	36,969 48
Iron rails, chairs and spikes .....	304,858 61	57,038 31	361,896 92
Fencing .....	5,657 00	1,126 20	6,783 20
Passenger and freight stations .....	10,803 10	5,980 10	16,783 20
Engine and car houses .....	3,757 97	76 98	3,834 95
Machine shops, machinery and fixtures .....	35,211 38	1,135 29	36,346 67
Other buildings and fixtures .....	18,656 87	3,570 62	22,227 49
Telegraph ....	8,042 80	473 73	8,786 53
Real estate .....	4,761 53	4,025 00	8,786 53
Truck scales .....	691 45	827 60	1,519 05
Total expenditures for construction ...	\$881,655 18	\$121,055 58	\$1,002,710 76

## COST OF ROAD AND EQUIPMENT, Etc.

## COST OF EQUIPMENT OWNED BY COMPANY.

Number—	
14 Locomotives .....	\$89,873 70
2 First-class passenger cars .....	7,700 00
20 Box freight cars .....	11,000 00
40 Platform cars .....	12,900 00
1 Baggage, mail and express car .....	2,350 00
6 Hand-cars .....	1,700 00
6 Caboose cars .....	8,430 46
275 Dump cars .....	117,500 00
Total cost of railroad equipment owned by company .....	\$251,454 16
Additions within the year ending April 1, 1881 .....	74,948 64
Average amount per mile (of single main track, 113.42 miles) .....	1,913 36
Proportion for Ohio (113.42 miles) .....	1,913 36
Total for road and equipment .....	1,254,164 92
Total average amount per mile (of single main track, 113.42 miles) .....	11,057 70
Proportion of same for Ohio (113.42 miles) .....	11,057 70

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Springfield, O. to Jackson, O. ....	108.87	108.87
Jackson to Coalton, O. ....	4.55	4.55
Total single main track .....	113.42	113.42
Aggregate of sidings and other tracks .....	8.79	8.79
Total length laid with rail computed as single track .....	122.21	122.21

Length in Ohio, distributed as follows:

County.	Main track.	Sidings, etc.	Total.
Clark .....	15.930	2.988	18.918
Madison.....	3.849	.129	3.978
Fayette .....	28.232	.538	28.770
Highland .....	1.695	.219	1.914
Ross .....	28.816	.725	29.541
Pike .....	18.845	.403	19.248
Jackson .....	16.053	3.788	19.841
Totals .....	113.420	8.790	122.210

GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft. 8½ in.
Rail—Iron—On road.....	113.42 miles.
Average weight per yard.....	37½ lbs.

BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 10; greatest age, 4½ years; aggregate length.....	1,785 feet.
Combination, 1; aggregate length .....	156 "

Total ..... 1,941 "

Trestles—32; greatest age, 4½ years; greatest height, 34 feet; greatest length, 1,600 feet; aggregate length, 12,000 feet.

Length of shortest span of truss, 29 ft.; of longest, 152 feet; greatest length of beams between points of support, if not trussed, 14 feet.

Greatest space between cross ties upon bridges and trestles, 14 inches; length of ties, 8 and 10 feet.

Number of track stringers, 1 and 2.

Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Yes.

How often? Every 30 days.

Are the examinations analytical, and are they made by a competent person? Yes.

FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	26	26
Length of road unfenced, and the reason therefor.....	87.42	87.42

CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Cincinnati, Sandusky and Cleveland Railroad at 1 mile from Springfield.

Pittsburgh, Cincinnati and St. Louis Railway at South Charleston.

Cincinnati and Muskingum Valley Railway at Washington C. H.

Dayton and Southeastern Railroad at Washington C. H.



Scioto Valley Railway at Waverly.

Marietta and Cincinnati switch at Jackson C. H.

What railroads cross your road either over or under your grade in this State, and where?

Marietta and Cincinnati Railroad at Greenfield.

Number of crossings of highways at grade in this State without protection, 104.

Number at which there are gates or flagmen, 1.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? No.

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated—all in Ohio.....	113.42
Miles of same owned by railroad company—all in Ohio.....	113.42

### STATIONS.

Passenger and freight—all in Ohio .....	10
Number with telegraph communication—all in Ohio .....	10
Number of same operated by railroad company—all in Ohio.....	10
Is pay received for messages sent over line owned by railroad company? Yes.	

## ROLLING STOCK.

Locomotives.....	14 ;	average weight.....	56,000 pounds.
Express and baggage cars .....	1 ;	" .....	30,000 "
Passenger cars.....	2 ;	" .....	36,000 "
Freight cars .....	20 ;	" .....	20,000 "
Other cars.....	321 ;	" .....	15,000 "

Number of locomotives equipped with train brakes, 3.

Kind of brake: Westinghouse.

Number of cars equipped with train brakes, 3.

Kind: Passenger, baggage, mail and express cars.

Number of passenger cars with "Miller Platform," 3.

Method of bridging between passenger cars, when two or more are run in trains:  
"Miller Platform."

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Soft coal stoves.

Means of lighting same: Candles.

### SPEED OF TRAINS.

Express passenger, average rate, including stops.....	18 miles per hour.
Mail and accommodation, .....	15 "
Freight trains, .....	10 "

## EMPLOYES.

Superintendents.....	1
Telegraph operators.....	12
Engineers.....	15
Baggagemen.....	3
Flagmen, switch-tenders and watchmen.....	2
Laborers.....	45
Clerks.....	5
Train dispatchers.....	2
Firemen.....	15
Wipers.....	5
Mechanics.....	16
Conductors.....	11
Brakemen.....	16
Station agents.....	19
Section men.....	120
Other employes.....	26

Total number employed by company in operating line ..... 313

Proportion for Ohio..... 313

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: U. S. and Adams Express Companies.

Terms: One and half first-class freight rates.

## RATES OF TRANSPORTATION.

	PASSENGERS.		
	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles.....	3 Cts.	3 Cts.	3 Cts.
For distances over 8 miles—First class .....	3	3	3

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Rail laid—New iron, 60 lbs. per yard—miles of track .....	10
Train mileage—Passenger.....	79,752
Freight.....	57,857
Mixed.....	51,620
Construction.....	22,729
Total.....	211,958
Car mileage—Passenger, express and baggage.....	107,346
Freight—loaded... ..	401,999
empty.....	678,920
Caboose.....	65,293
Construction and other .....	89,604
Total.....	1,343,162

Fuel consumed—Wood, 101 cords; coal, 4,709 tons. Total cost .....	\$6,723 86
Losses, etc., paid—On goods and baggage .....	175 00
For animals killed in Ohio:	
1 horse .....	\$70 00
2 mules .....	65 00
10 cattle .....	339 00
17 hogs .....	178 00
Total .....	\$652 00

## TRANSPORTATION.

Passengers—Number carried—local .....	30,360
Average number carried in each car per trip .....	33.73
Average number of miles traveled by each .....	42½
Total mileage, or number carried one mile .....	1,290,300
Average amount received for each .....	\$1 07
Average amount <i>per mile</i> received for each .....	2.53 cts.
Freight—Tons carried, local .....	91,987
Average tons in each loaded car per trip .....	10
Total movement, or tons carried one mile .....	7,185,512
Average amount received for each ton .....	\$1 45
Average amount <i>per mile</i> received for each ton .....	1.85 cts.

## Articles transported :

	Tons.	Per cent.
Coal .....	59,463	64.63
Stone, lime, sand, etc .....	1,209	1.32
Pig and bloom iron .....	2,532	2.75
Lumber and other forest products .....	16,898	18.38
Grain, flour, and other agricultural products .....	5,606	6.09
Live stock .....	862	.94
Animal products .....	168	.18
Manufactures, including agricultural implements .....	816	.89
Merchandise .....	2,430	2.64
Miscellaneous .....	2,003	2.18
Total tonnage yielding revenue .....	91,987	100
Supplies for company's use .....	6,569	

## EARNINGS, OPERATING EXPENSES, Etc., FOR EIGHT MONTHS ENDING MARCH 1st.

## EARNINGS.

Passenger transportation—local .....	\$32,646 87
Freight transportation—local .....	133,394 40
Mail service .....	5,246 70
Express service .....	932 41
Other sources .....	9,401 38
Total earnings of line operated included in this report .....	\$181,621 76

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$65,589 29	
Maintenance of cars.....	15,031 09	
Motive power .....	40,400 30	
Conducting transportation .....	43,204 19	
General expenses, as follows :		
Taxes in Ohio .....	\$3,678 34	
Salaries .....	4,535 99	
Other general expenses of operating.....	4,517 39	
		12,731 72
<hr/>		
Total operating expenses, being 97.43 per cent. of earnings.....		\$176,956 59
Net earnings of 113.42 miles operated.....		4,665 17
Net income over operating expenses and rents paid.....		4,665 17
Percentage of same to capital stock and debt.....		$\frac{3}{8}$ of 1%
Percentage of to total means applied to construction, etc.....		$\frac{2}{5}$ of 1%
Per mile of earnings .....		\$1,601 32
operating expenses .....		1,560 19
net earnings.....		41 13

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Sale of bonds of company (\$383,200 at par) .....	\$383,200 00
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$6,027 00
Construction of new work.....	121,055 58
Additional equipment .....	74,948 64

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$525,500 00	
First mortgage bonds .....	583,200 00	
Suspense account.....	59,936 57	
Bills payable .....	28,870 98	
Operating account .....	167,549 14	
Coupon interest account .....	6,027 00	
<hr/>		
Total .....		\$1,371,083 69

## ASSETS.

Construction .....	\$1,002,710 76
Equipment.....	251,454 16

Supplies on hand.....	28,081 38	
Cash on hand .....	2,374 21	
Remittance account.....	4,425 00	
Bills receivable.....	100 00	
Balances due from agents.....	44 66	
Operating accounts .....	78,843 33	
Profit and loss account.....	3,050 19	
<hr/>		
Total.....		\$1,371,083 69

*State of Ohio, County of Clark, ss.:*

William N. Whiteley, President of the Springfield Southern Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

WILLIAM N. WHITELEY,

*President.*

Subscribed and sworn to before me, this 7th day of November, A. D. 1881.

[SEAL]

E. BOWMAN,

*Notary Public.*

## ST. CLAIRSVILLE AND NORTHERN RAILWAY.

Name of road : St. Clairsville & Northern Railway.  
 By whom owned : Village of St. Clairsville, Ohio.  
 By whom operated : The Trustees of said railway.  
 By what authority : By an act of the General Assembly of Ohio.  
 Name of person making this report : C. W. Carroll, Secretary of Board of Trustees.  
 General office at St. Clairsville, O.  
 Principal office in Ohio at St. Clairsville.  
 Address correspondence relating to this report to C. W. Carroll, St. Clairsville, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

In addition to the history heretofore given, it can be said that the road is still in process of construction, and therefore not yet open for general traffic.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Thos. E. Clark.....	President .....	St. Clairsville, O.....	.....
C. W. Carroll.....	Secretary.....	" .....	.....
Hiram Boroff.....	Treasurer .....	" .....	.....
Thos. E. Clark.....	} Executive Committee. {	" .....	.....
Hiram Boroff.....		" .....	.....
C. W. Carroll.....		" .....	.....

### BOARD OF TRUSTEES.

Name.	Residence.	Name.	Residence.
Thos. E. Clark.....	St. Clairsville, O.	David Darrah.....	St. Clairsville, O.
Hiram Boroff.....	"	C. W. Carroll.....	"
A. G. Swanley.....	"		

### CAPITAL STOCK.

Funds for the construction of railway were realized from the sale of bonds issued on the faith of the village of St. Clairsville, pursuant to an enabling act of the General Assembly of the State of Ohio, passed June 17, 1879. (Vol. 76, 180.)

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
Bonds issued by the village of St. Clairsville, O.	By the faith of said village and 1st mortgage on road.....	1881.				
		March 1	Sept. 1, 1883	6	\$100	\$100
		April 1	" 1883	6	900	900
		1	" 1884	6	1,500	1,500
		1880.				
		October 1	" 1885	6	1,700	1,700
		1881.				
		March 15	" "	6	300	300
		" "	" 1886	6	2,000	2,000
		Feb'y 1	" 1887	6	300	300
		January 1	" "	6	1,700	1,700
		" "	" 1888	6	2,000	2,000
		" "	" 1889	6	2,000	2,000
		" "	" 1890	6	2,500	2,500
		Dec. 1	" 1891	6	900	900
		Nov. 1	" "	6	1,600	1,600
		Oct. 1	" 1892	6	3,000	3,000
		1	" 1893	6	3,000	3,000
		1	" 1894	6	3,000	3,000
		1	" 1895	6	3,000	3,000
Total.....					\$30,000	\$30,000

Average amount per mile of single main track (3.50 miles)..... \$8,571 43

Proportion of same for Ohio, 3.50 miles.

Increase since June 30, 1880, all issued within the year.

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

Expenditures for the year ending June 30, 1881—

Right of way .....	\$1,287 50
Civil engineering .....	630 62
Grading and masonry .....	5,954 98½
Bridges .....	3,075 04
Timber and ties .....	2,600 00
Superstructure .....	400 00
Iron rails, chairs and spikes .....	8,520 06
Fencing .....	1 50
Engine and car houses .....	28 21
Contingent expenses.....	1,061 96

Total expenditures for construction..... \$23,559 87½

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 1 .....	\$3,500 00
First class passenger cars, 1 .....	2,250 00
Platform cars, 2 .....	600 00
Hand cars, 1 .....	25 00
All other rolling stock, tools, machinery, etc.....	401 25
<hr/>	
Total cost of railroad equipment owned as aforesaid.....	\$6,776 25
Additions within the year ending June 30, 1881. All within the year.	
Average amount per mile (of single main track, 3.50 miles) .....	1,936 07
Proportion for Ohio (3.50 miles) .....	1,936 07
Total for road and equipment .....	\$30,336 12½
Total average amount per mile (of single main track, 3.50 miles) .....	8,667 46
Proportion of same for Ohio (3.50 miles) .....	8,667 46

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—St. Clairsville, O., to St. Clairsville Junction, on C., T. V. & W. R'y .....	3.50 mi.	3.50 mi.
Length in Ohio, distributed as follows:		
All in Belmont county, O.; total main track, 3.50 miles.		

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	3 feet.
Grade—Maximum, per mile.....	150 "
Longest maximum.....	5,000 "
Aggregate length of maximum .....	5,000 "
Curvature—Shortest radius.....	358 "
Aggregate length of shortest radius.....	358 "
Rail—Iron—On road.....	3.50 miles.
Average weight per yard.....	30 lbs.
Ties—Average number per mile.....	2,640
Number laid during the year .....	9,240

## BRIDGES, TRETTLES, ETC., IN OHIO.

Bridges—Wood, 14; greatest age, new; aggregate length, 420 ft.  
 Combination. 1; greatest age, new; " 130 ft.

Total ..... 550 ft.

Trestles—2; greatest age, new; greatest height, 10 ft.; greatest length, 143; aggregate length, 168 ft.

Greatest length of beams between points of support, if not trussed, 16 ft.  
 Greatest space between cross ties upon bridges and trestles, 7 inches;  
 length of ties, 7 feet.



Are all bridges and trestles provided with guard rails? Yes.

Do all bridges and trestles receive stated examinations? Carefully examined, but not at stated periods.

How often? About once a month.

Are the examinations analytical, and are they made by a competent person? Made by foreman of road.

#### ROLLING STOCK.

Locomotives, 1—weight, lbs.....	23,000
Passenger cars, “.....	18,000
Freight cars, “.....	8,000

Above includes all owned by trustees reporting.

Number of locomotives equipped with train brakes: None.

Kind of brake: Common hand brake.

Are all cars run on this road heated and lighted as prescribed by law? Partially arranged for heating and lighting according to law.

State methods of heating cars used for the transportation of passengers: Common car stove.

Means of lighting same: Spermaceti candles.

#### RATES OF TRANSPORTATION.

No fixed rates of transportation.

#### DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Wheeling creek bridge; construction, Pratt truss combination railroad bridge; material, wood and iron; length, 130 ft.

Trestles built in Ohio, 2; aggregate length, 168 ft.

Grading—Miles of main track graded in Ohio, 3.50.

Rail laid—New iron, 30 lbs. per yard—miles of track, 3.50.

#### OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

##### RECEIPTS OTHER THAN EARNINGS.

Sale of bonds of village, \$30,000, at 100 cents .....	\$30,000 00	
Sale of other stocks, bonds and securities.....	5,415 00	
	<hr/>	\$35,415 00

##### PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Construction of work.....	\$23,559 87½	
Equipment .....	6,776 25	
	<hr/>	\$30,336 12½

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

First mortgage bonds.....	\$30,000 00	
Proceeds of sale of certificates of stock in the Central Ohio Railroad, transferred to trustees aforesaid by the trustees of Richland township, of Belmont county, pursuant to law .....	5,415 00	\$35,415 00

## ASSETS.

Construction .....	\$23,559 87 $\frac{1}{4}$	
Rolling stock and tools.....	6,776 25	
Cash in treasury.....	5,078 87 $\frac{3}{4}$	\$35,415 00

*State of Ohio, County of Belmont, ss.:*

Thomas E. Clark, of the St. Clairsville and Northern Railway, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

T. E. CLARK.

[SEAL OF R. R.]

Subscribed and sworn to before me this 31st day of August, A. D. 1881.

[SEAL.]

A. C. DARRAH, *Clerk.*

## ST. CLAIRSVILLE RAILWAY COMPANY.

Name of road : St. Clairsville Railway.

By whom owned : St. Clairsville Railway Company.

By whom operated : Same.

By what authority : By purchase.

Name of company making this report : St. Clairsville Railway Company.

General office at St. Clairsville, Ohio.

Principal office in Ohio at St. Clairsville, Ohio.

Address correspondence relating to this report to C. W. Carroll, Secretary, at St Clairsville, Ohio.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Isaac H. Patterson.....	President.....	St. Clairsville, O.....	
C. W. Carroll.....	Secretary.....	".....	\$250 00
J. R. Mitchell .....	Treasurer.....	".....	
James White.....	General Passenger, freight and ticket agent .....	".....	480 00
Isaac H. Patterson.....	} Executive committee... {	".....	
Wm. P. Frasier.....		".....	
C. W. Carroll.....		".....	

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Isaac H. Patterson.....	St. Clairsville ...	Jos. F. Charlesworth.....	St. Clairsville.
Wm. P. Frasier.....	" .....	Wilson S. Kennon .....	" .....
Conrad Troll.....	" .....	C. W. Carroll.....	" .....
Joshua Worly.....	" .....		

### CAPITAL STOCK.

#### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$13,000 00
Number of shares—common .....	260
Par value of each—common.....	50 00
Road purchased by present company at judicial sale for \$18,500.	

No capital stock actually issued. The bondholders of the late Bellaire and St. Clairsville Narrow Gauge Railway Company purchased road at judicial sale and hold an interest in same in proportion to such bonds held by each, respectively.

Stockholders, residents of Ohio, 14.

Amount of stock held by them June 30, 1881..... \$13,000 00

#### OTHER INDEBTEDNESS.

Debt contracted to pay balance of purchase money.....	\$550 00	
Net unfunded debt.....		\$550 00
Average amount per mile of single main track.....	\$83 00	
Proportion of same for Ohio.....	All.	
Increase since June 30, 1880.....		
Decrease since June 30, 1880.....	No increase.	
Total net debt liabilities.....		
Average amount per mile of single main track.....		
Proportion of same for Ohio.....		
Total of paid in stock and debt.....		\$18,500 00
Total average amount per mile .....	\$2,782 95	
Proportion of same for Ohio, all.		

#### COST OF ROAD EQUIPMENT, ETC.

##### ROAD ACQUIRED BY PURCHASE.

Bellaire and St. Clairsville Narrow Gauge Railway (original cost, \$42,650.61); purchased for..... \$18,500 00

#### CHARACTERISTICS, ETC.

##### LINE IN OPERATION.

	Length.	In Ohio.
Single main track, St. Clairsville, O., to Quincy, Ohio.....	6.65	6.65
Total single main track.....	6.65	6.65
Aggregate of sidings and other tracks.....	35	35
Total length laid with rail compted as single track .....	7.00	7.00
Length in Ohio, distributed as follows:		
All in Belmont county: Main track, 6.65; sidings, etc., .35; total, 7.00.		

##### GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	3 feet.
Grade—Maximum, per mile.....	142 "
Longest maximum.....	1,000 "
Aggregate length of maximum .....	1,000 "
Curvature—Shortest radius.....	286 "
Aggregate length of shortest radius.....	286 "
Aggregate length of all radii, not known.	
Aggregate length of tangent .....	"

Rail—Iron—On road.....	6.65 miles.
Average weight per yard.....	30 lbs.
Ties—Average number per mile .....	2,640
Ballasted—On whole line .....	6.65 miles.
In Ohio .....	6.65 “
With gravel and coal slack.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 12; greatest age 5 years; aggregate length, 240 ft.	
Greatest space between cross ties upon bridges and trestles, 18 inches; length of ties, 6 feet.	
Are all bridges and trestles provided with guard rails? No.	
Do all bridges and trestles receive stated examinations? Carefully examined, but not at stated periods.	
How often? At least once each month.	
Are the examinations analytical, and are they made by a competent person? By foreman of road.	

## FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line, whole line, about 6 miles; in Ohio, 6 miles.	
Kind of fencing, as follows:	
Post and board (average cost per rod, \$1.40).	
Average cost of same per rod, \$1.40.	
Length of road unfenced, and the reason therefor: 3½ miles by agreement with land-owners.	

## ROLLING STOCK.

Locomotives .....	1; Average weight.....	36,000 lbs.
Passenger cars .....	1; “ .....	16,000 “
Freight cars.....	2; “ .....	8,000 “
Number of cars equipped with train brakes, 3.		
Kind: Common hand brake.		
Are all cars run on this road heated and lighted as prescribed by law? Partially.		
State methods of heating cars used for the transportation of passengers: The ordinary car stove.		
Means of lighting same: Spermaceti candles.		

## SPEED OF TRAINS.

Mail and accommodation, average rate, including stops .....	25 miles per hour
Freight trains .....	15 “

## EMPLOYES.

Superintendents.....	1
Engineers .....	1

## ST. CLAIRSVILLE RAILWAY.

1299

Clerks .....	1
Firemen .....	1
Conductors.....	1
Station Agents .....	1
Section men.....	6

Total number employed by company in operating line .....	12
Proportion for Ohio.....	All.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.	Average life in years.
Locomotives—Passenger .....	5
Cars—Passenger.....	5
Flat .....	5
Rails—Iron .....	5
Joint fastenings .....	5
Frogs .....	5
Ties—Oak.....	5
Bridges—Wooden .....	5
Fence posts .....	5

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles .....	4 Cts.	2 Cts.	3½ Cts.
For distances over 8 miles—Excursion .....	3	1½	2¼

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton: All classes about .....	8	5	6½
Rate per ton per mile for—			
Coal—Carried less than ten miles .....	37½	37½	37½
Limestone—Carried less than ten miles.....	37½	37½	37½
Undressed stone or lumber—Carried less than ten miles .....	37½	37½	37½
Rate per 100 lbs. for loading and unloading: No charge.			

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Train mileage—Passenger .....	21,910
Freight.....	16,800
Total.....	38,710

Car mileage—Passenger .....	21,910	
Freight—loaded.....	12,600	
empty .....	4,200	
Total.....		38,710
Fuel consumed—Wood, 25 cords; coal, 226 tons. Total cost .....		\$257 25
Losses, etc., paid—For animals killed in Ohio:		
Cattle, 1.....		20 00

## TRANSPORTATION.

Passengers—Number carried, local .....	3,495	
through .....	12,451	
Total .....		15,946
Average number carried in each car per trip .....		26
Average number of miles traveled by each.....		4.1
Total mileage, or number carried one mile .....		106,049
Average amount received for each.....	22½ cents.	
Average amount <i>per mile</i> received for each .....	3½ "	
Freight—Tons carried, local (coal).....	4,024	
through .....	550	
Total.....		4,574
Average tons in each loaded car per trip .....		8
Average tons in each loaded car per mile .....		40
Total movement, or tons carried one mile .....		22,875
Average amount received for each ton.....	37½ cts.	
Average amount <i>per mile</i> received for each ton.....	5½ "	
Average cost per ton freight per mile.....	3½ "	
Average amount received for each ton through freight.....	37½ "	
Average amount received for each ton local freight.....	37½ "	
Average cost each ton through freight.....	About 20	
Average cost each ton local freight .....	About 20	
Articles transported:	Tons.	Per cent.
Coal .....	4,024	88
Stone, lime, sand, etc.....	20	04
Merchandise .....	500	11
Miscellaneous .....	30	06
Total tonnage yielding revenue .....	4,574	100.

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—local.....	\$479 20	
through .....	3,112 75	
Total .....		\$3,591 95

## ST. CLAIRSVILLE RAILWAY.

1301

Freight transportation—local.....	\$1,504 00	
through.....	602 15	
	<hr/>	
Total .....		\$2,106 15
Mail service.....		387 64
		<hr/>
Total earnings of line operated included in this report.....		\$6,085 74

OPERATING EXPENSES.

Maintenance of way and structures.....	\$1,422 28	
Maintenance of cars .....	23 60	
Motive power.....	88 87	
Conducting transportation .....	1,474 50	
General expenses:		
Taxes in Ohio.....	121 98	
Salaries .....	494 10	
Other general expenses of operating .....	645 54	
Total operating expenses, being 70 $\frac{1}{2}$ per cent. of earnings.....		\$4,270 87
Net earnings of 6.65 miles operated.....		\$1,814 87
Percentage of to total means applied to construction, etc., 9.75.		
Per mile of earnings, \$935.25 ; proportion for Ohio, all.		
Per mile of operating expenses, \$656.05.		
Per mile of net earnings, \$279.20.		

OTHER PAYMENTS WITHIN THE YEAR.

PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on floating debt .....	\$343 09	
Floating debt liquidated.....	1,382 21	
One of accidents.....	20 00	
	<u>          </u>	\$1,745 30

CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

LIABILITIES.

Capital stock .....	\$13,000 00
Bills payable.....	5,500 00
Income account .....	1,814 87
	<u>\$20,314 87</u>



## ASSETS.

Cost of railway .....	\$18,500 00	
Bills receivable.....	1,382 21	
Interest paid.....	343 09	
Fuel .....	20 00	
Cash in Treasury.....	69 57	
		<hr/> \$20,314 87

*State of Ohio, County of Belmont, ss.:*

Isaac H. Patterson, President of the St. Clairsville Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

Subscribed and sworn to before me, this 18th day of August, A. D. 1881.

[SEAL]

J. H. PATTERSON,

*Pres't St. C. R'y Co.*

T. W. EMERSON.

## TOLEDO, ANN ARBOR AND GRAND TRUNK RAILWAY COMPANY.

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Name of road: Toledo, Ann Arbor and Grand Trunk Railway.

By whom owned: Toledo, Ann Arbor and Grand Trunk Railway Company.

By whom operated: Toledo, Ann Arbor and Grand Trunk Railway Company.

Name of company making this report: Toledo, Ann Arbor and Grand Trunk Railway Company.

General office at Toledo, Ohio.

Principal office in Ohio at Toledo, Ohio.

Address correspondence relating to this report to B. F. Jervis, Auditor, at Toledo, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Toledo, Ann Arbor and Grand Trunk Railway is a corporation organized by a consolidation of the Toledo & Ann Arbor Railroad Company and the Toledo, Ann Arbor and North-eastern Railroad Company, the Toledo and Ann Arbor Railroad Company being consolidated with the Toledo and State Line Railroad Company.

Articles of association of the Toledo, Ann Arbor and Northern Railroad were made and entered into on the 20th October, 1869.

The capital stock of the corporation was one million dollars. The purpose of this organization was to build a railroad from the State Line between Ohio and Michigan, through the counties of Monroe and Washtenaw to Ann Arbor, thence north to Owasco, Michigan.

This company commenced work on its line of survey, and made a large portion of the road-bed between the State Line and Ann Arbor, and secured much of the right of way, expending about one hundred and fifty dollars. In 1873 and 1874 the company became financially embarrassed, and upon the application of Benj. R. Crane, and of its creditors it was adjudged a bankrupt, and E. D. Kinne, of Ann Arbor, Michigan, was appointed assignee, who, on the 14th of September, 1875, sold the property and franchise of the Toledo, Ann Arbor & Northern Railroad Company to Benj. P. Crane, of Ann Arbor, who, in turn, sold them to Hon. James M. Ashley, of Toledo, Ohio, who, on the 23rd of November, 1877, filed a declaration of incorporation, creating the Toledo & Ann Arbor Railroad Company. After the organization of the Toledo, Ann Arbor & Northern Railroad Company, The Toledo & State

Line Railroad Company was organized. The articles of association of this company bear date of June 15, 1872, to T. Thayer, J. R. Osborne, J. A. Latchie, Wagner Swayne and Abner L. Backus, who were the corporators. This company was organized for the purpose of building a railroad from the city of Toledo, State of Ohio, to the State Line, there to connect with the proposed line of the Toledo, Ann Arbor & Northern Railroad then being built; after this road was built to the State Line it was leased by the Pennsylvania Company, and it was operated as a railroad by that company until May, 1878, when it was purchased by and consolidated with the Toledo & Ann Arbor Railroad.

In February, 1878, The Toledo, Ann Arbor & North-eastern Railroad Company was organized to build a railroad from the city of Ann Arbor, State of Michigan, to Pontiac. Work was commenced on this line in October, 1879, and much of the grading and most of the right of way had been secured before this corporation was consolidated with the Toledo, Ann Arbor & Grand Trunk Railway Company. On the 16th day of October, 1880, work between Ann Arbor and Pontiac was suspended in December, 1880, and was again commenced in May, 1881. The line between Ann Arbor and South Lyon will be open for business about 1st of September, 1881.

NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Jas. M. Ashley.....	President.....	Toledo, O.....	.....
A. L. Holman.....	Secretary.....	New York.....	.....
H. R. McEligrath.....	Treasurer.....	".....	.....
B. F. Jarvis.....	Auditor.....	Toledo, O.....	.....
H. W. Ashley.....	General Superintendent..	".....	.....
G. W. Layng.....	General Passenger Agent..	".....	.....
".....	General Freight Agent....	".....	.....
".....	General Ticket Agent.....	".....	.....

DIRECTORS.

Name.	Residence.	Name.	Residence.
Parker Handy.....	New York.. ..	Jas. M. Ashley .....	Toledo, O.
J. W. Nash.....	".....	" Jr.....	"
C. L. Luce.....	Toledo, C.....	Geo. Emerson.....	"
F. C. Chapin .....	".....		

# CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$1,500,000 00
Number of shares—common .....	15,000
Par value of each—common .....	\$100 00
Capital stock authorized by vote of company—common.....	1,500,000 00
Amount subscribed—common.....	1,500,000 00
Total paid in capital stock—common .....	459,231 51
Average amount paid in per mile of single main track (46 miles).....	9,983 29
Proportion of same for Ohio (5 miles).....	49,916 45

Capital stock issued, and on what account, as follows: James M. Ashley, contractor; No. shares, 14,900; amount of common, \$1,400,900.

Stockholders, residents of Ohio, 6.

Amount of stock held by them June 30, 1881, \$113,100.

Agents authorized to transfer stock: A. L. Holman, Secretary, New York.

## FUNDED DEBT.

Kind of bond or obligations, bond; if and how secured, mortgage; date of issue, May 1, 1878; when due, May 1, 1898; rate of interest, 6 per cent.; amount of authorized issue, \$750,000; amount actually issued, \$750,000.	
Average amount per mile of single main track (46 miles).....	\$16,304 34
Proportion of same for Ohio (5 miles).....	81,521 70

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate .....	\$5,426 34
All other debts, current credit balances, etc.....	51,742 97
Total unfunded debt.....	57,169 31
Cash securities, debit balances, etc., available to payment.....	31,886 88
Net unfunded debt .....	25,282 42
Average amount per mile of single main track.....	549 61
Proportion of same for Ohio.....	2,748 05
Decrease since June 30, 1880.....	3,891 46
Total net debt liabilities.....	27,125 89
Average amount per mile of single main track.....	589 69
Proportion of same for Ohio.....	2,948 45

N. E.—Credits for subscription and items not due as debts, amounting to \$1,836.46, not included as debts in above.

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expend- itures to July 1, 1881.
Right of way.....	\$199,145 05	\$575 75	\$199,720 80
Civil engineering.....	2,610 38		2,610 38
Grading and masonry .....	64,105 23	465 68	64,570 91
Bridges.....	5,236 08		5,236 08
Timber and ties .....	43,664 00	3,044 92	46,708 92
Superstructure .....	20,000 00	174 53	20,174 53
Iron rails, chairs, and spikes .....	131,040 00	54 83	131,094 83
Fencing.....	5,071 38	6,736 64	11,808 02
Passenger and freight stations.....	6,118 86	55 30	6,174 16
Engine and car houses.....	838 17	48 12	886 29
Machine shops, machinery and fixtures .....		134 43	134 43
Other buildings and fixtures .....		2,414 52	2,414 52
Telegraph.....	3,412 53		3,412 53
Interest and discount .....	31 09		31 09
Contingent expenses.....	9,574 89	411 72	9,986 61
Total expenditures for construction	\$490,847 66	\$14,116 44	\$504,964 10

## ROAD ACQUIRED BY PURCHASE.

Toledo and State Line Railroad .....	\$80,000 00
Total expended for construction and purchase.....	584,964 10
Average cost per mile of road constructed (single main track, 41 miles)..	14,267 41
Average cost per mile of road owned by company (single main track, 46 miles) .....	12,716 61
Proportion of same for Ohio (5 miles).....	63,583 05

## COST OF EQUIPMENT OWNED BY COMPANY.

1 locomotive.....	\$2,000 00
Section cars .....	65 90
All other rolling stock, tools, machinery, etc.....	152 33
Total cost of railroad equipment owned by company.....	2,218 23
Average amount per mile (of single main track, 46 miles).....	48 22
Proportion for Ohio (5 miles) .....	241 10
Total for road and equipment.....	587,182 33
Total average amount per mile (of single main track, 46 miles) .....	12,764 83
Proportion of same for Ohio (5 miles).....	63,824 13
Real estate not included in the foregoing accounts.....	10,700 00
Total permanent investment.....	597,882 33
Proportion for Ohio (5 miles) .....	64,987 20
Average per mile (of single main track, 46 miles) .....	12,997 44

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—Toledo to Ann Arbor .....	46	5
Aggregate of sidings and other tracks .....	2.5	
Total length laid with rail computed as single track .....	48.5	5
Length in Ohio, distributed as follows:		
Lucas county, main track, 5.		

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 8½ in.
Rail—Iron—On road .....	48.5 miles.
Average weight per yard .....	50 lbs.
Ties—Average number per mile.....	2,680
Ballasted—On whole line .....	46 miles.
In Ohio.....	5 "
With sand and gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood—1; greatest age, 3 years; length, 36 feet.
Trestles—3; greatest age, 10 years; greatest height, 16 feet; greatest length, 1,013 ft.; aggregate length, 2,275 ft.
Length of shortest span of truss, 36 ft.; of longest, 36 ft.; greatest length of beams between points of support, if not trussed, 15 feet.
Greatest space between cross ties upon bridges and trestles, 8 inches; length of ties, 10 feet.
Number of track stringers, 4.
Are all bridges and trestles provided with guard rails? Yes; wood.
Do all bridges and trestles receive stated examinations? Yes.
How often? Monthly.
Are the examinations analytical, and are they made by a competent person?
Yes.

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole Line.	In Ohio.
Number miles fencing, computed as single line.....	82	9
Kind of fencing, as follows:		
Post and board (average cost per rod, 80c.)		
Wire (average cost per rod, 68c.)		
Average cost of same per road, 75c.		
Length of road unfenced, and the reason therefor: 9 miles in Michigan, now under contract.		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Lake Shore & Michigan Southern R'y at Detroit Junction (Alexis).

Canada Southern R'y at Detroit Junction (Alexis).

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated.....	46; in Ohio, 5
Miles of same owned by railroad company.....	46; " 5

## STATIONS.

Passenger and freight.....	14; in Ohio, 2
Number with telegraph communication.....	8; " 2
Number of same operated by railroad company.....	8; " 1

Is pay received for messages sent over line owned by railroad company? Yes, for commercial business.

## ROLLING STOCK.

Locomotives.....	6
Express and baggage cars .....	2
Passenger cars.....	3
Freight cars.....	29

Above includes not owned by company reporting.

Locomotives .....	5; owned by John B. Alley, Boston, Mass.
Express and baggage cars.....	2; " "
Passenger cars .....	3; " "
Freight cars .....	29; " "

Number of locomotives equipped with train brakes, 3.

Kind of brake: Westinghouse air.

Number of cars equipped with train brakes, 5.

Kind: Westinghouse.

Number of passenger cars with Miller Platform, 3.

Method of bridging between passenger cars, when two or more are run in trains:

Miller platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: James

Spear & Co., pat. anti-clinker car heater; No. 6 coal stove.

Means of lighting same: Coach candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	25 miles per hour.
Mail and accommodation, .....	15      "
Freight trains, .....	15      "

## EMPLOYEES.

Superintendents.....	1
Telegraph operators.....	8
Engineers.....	3
Baggagemen.....	1
Flagmen, switch-tenders and watchmen .....	3
Laborers .....	5
Clerks.....	4
Train dispatchers.....	1
Firemen.....	3
Wipers.....	2
Mechanics .....	5
Conductors.....	2
Brakemen.....	3
Station agents .....	9
Section men.....	36

Total number employed by company in operating line.....	85
Proportion for Ohio.. ..	9

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American Express Company.

Terms: On contract at specific price, per 100 lbs., 1½c., 1st class.

Special freight and transportation lines: Detroit, Butler & St. Louis R. R., between Toledo and Milan, 30 miles. Canada Southern Railway, between Toledo and Detroit Junction, 5 miles.

Terms as to rates (use of track, machinery, repair of cars), etc., with each:

Canada Southern Railway, 50c. per loaded car, 5c. per head for passengers.

Detroit, B. & St. Louis R. R., \$2.00 per loaded car.

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles .....	3 Cts.	3 Cts.	3 Cts.
Over 8 miles—First class .....	3	2	2½
Excursion .....	2	1	1½



## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

First class.....	.434	...	...
Second class.....	.326	...	...
Third class.....	.239	...	...
Fourth class .....	.173	...	...
Fifth class .....	.152	...	...

Rate per ton per mile on freight carried less than 30 miles :

First class .....	11.8	...	...
Second class .....	10.	...	...
Third class.....	9.1	...	...
Fourth class.....	6.36	...	...

Rate per ton per mile on freight carried more than 30 miles :

First class.....	8.6	...	...
Second class.....	6.5	...	...
Third class.....	4.8	...	...
Fourth class.....	3.5	...	...

Rate per ton per mile for—

Coal—Carried ten miles or more.....	3.2	...	...
Carried less than ten miles.....	6.2	...	...
Pig iron—Carried 10 miles or more.....	8.2	...	...
Carried less than 10 miles.....	7.8	...	...
Limestone—Carried 10 miles or more.....	10.	...	...
Carried less than 10 miles.....	10.	...	...
Iron ore—Carried 10 miles or more.....	10.	...	...
Carried less than 10 miles.....	10.	...	...
Undressed stone or lumber—Carried 10 miles or more...	11.	...	...
Carried less than 10 miles..	11.	...	...

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Train mileage—Passenger .....	29,090	
Freight .....	28,620	
Total.....		57,710
Car Mileage—Passenger .....	72,750	
Express and baggage .....	61,293	
Freight—loaded.....	142,719	
empty .....	85,409	
Total .....		362,171
Fuel consumed—Wood, 367 cords; coal, 3,487 tons. Total cost .....		\$10,591 53
Losses, etc., paid—On goods and baggage .....		47 60

## TRANSPORTATION.

Passengers—Number carried—local.....	32,652	
through.....	8,015	
Total .....		40,667
Average number carried in each car per trip .....		33
Average number of miles traveled by each .....		34
Total mileage, or number carried one mile .....		1,372,678
Average amount received for each.....		98c.
Average amount <i>per mile</i> received for each .....		1.63c.
Freight—Tons carried—local.....	25,586	
through.....	14,982	
Total .....		40,568
Average tons in each loaded car per trip.....		10
Average tons in each loaded car per mile.....		10
Total movement, or tons carried one mile .....		1,252,060
Average amount received for each ton .....		97.34c.
“      amount <i>per mile</i> received for each ton .....		3.5c.
“      amount received for each ton through freight.....		75.56
“      amount received for each ton local freight.....		1.10
 Articles transported :		
	Tons.	Per cent.
Coal.....	11,556	28.49
Stone, lime, sand, etc.....	.524	1.29
Petroleum .....	151	.37
Pig and bloom iron.....	1,804	4.45
Manufactured iron.....	346	.85
Lumber and other forest products .....	14,524	35.80
Grain, flour, and other agricultural products.....	6,321	15.58
Live stock.....	176	.43
Animal products .....	327	.81
Manufactures, including agricultural implements .....	1,913	4.72
Merchandise.....	1,683	4.15
Miscellaneous.....	1,243	3.06
Total tonnage yielding revenue.....	40,568	100.
Supplies for Company's use.....	4,062	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30TH.

## EARNINGS.

Passenger transportation—local .....	\$14,147	09
through .....	8,246	73
Total .....		\$22,393 82
Freight transportation—local .....	\$28,208	26
through .....	11,321	10
Total .....		39,529 36

Mail service .....	1,929 74
Express service.....	1,649 68
Other sources .....	31,319 86
Total earnings of line operated included in this report ...	\$96,822 46

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$15,735 60
Maintenance of cars .....	2,806 20
Motive power.....	26,133 77
Conducting transportation.....	16,913 42
General expenses:	
Taxes in Michigan.....	43 03
Salaries.....	3,130 00
Other general expenses of operating .....	2,578 80
Total operating expenses, being 69 per cent. of earnings .....	67,340 82
Net earnings of 46 miles operated.....	29,481 64
Rentals paid.....	23,276 20
Net income over operating expenses and rents paid .....	6,205 44

## PAYMENTS WITHIN THE YEAR.

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Floating debt liquidated.....	\$3,891 46
Construction of new work.....	1,673 23
Additional equipment.....	2,218 23

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital.....	\$459,239 51
Bonds .....	750,000 00
James M. Ashley, President.....	5,426 34
Freight .....	67,181 36
Passenger.....	22,803 62
Earnings. } Mail.....	1,929 74
} Express.....	1,649 68
} Miscellaneous .....	3,258 06
Surplus July 1, 1880.....	11,311 49
Bills payable.....	44,579 80
Due to railroads.....	2,026 43
Ticket balances.....	1,502 40
Other accounts.....	2,818 37
Due station agents.....	2,659 43
	<hr/>
	\$1,376,836 23

ASSETS.

Construction account.....	\$583,295 80	
Real estate .....	10,700 00	
Right-of-way .....	474 00	
Telegraph line.....	3,412 53	
Bonds delivered to John B. Alley.....	656,000 00	
Conducting transportation.....	39,989 62	
Motive power.....	26,133 77	
Repairs.....	18,541 80	
General expenses.....	5,951 83	
Due from corporations.....	25,010 80	
"    station agents.....	2,486 09	
"    individuals.....	3,577 10	
Cash.....	812 89	
		\$1,376,386 23

*State of Ohio, County of Lucas, ss.:*

Benjamin F. Jervis, Auditor of the Toledo, Ann Arbor and Grand Trunk Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

B. F. JERVIS.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 31st day of August, A. D. 1881.

EDWARD D. MOORE,

[SEAL.]

*Notary Public, Lucas County, Ohio.*

**TOLEDO, CANADA SOUTHERN AND DETROIT RAILWAY COMPANY, AND CANADA SOUTHERN RAILWAY COMPANY OPERATING.**

Name of road: Toledo, Canada Southern and Detroit Railway.

By whom owned: Canada Southern Railway Company.

By whom operated: Canada Southern Railway Company.

By what authority: Stock ownership.

Name of company making this report: Canada Southern Railway Company.

General office at Grosse Isle, Michigan.

Principal office in Ohio at Toledo.

Address correspondence relating to this report to M. H. Taylor, Auditor, at St. Thomas, Ontario.

**HISTORY OF ORGANIZATION AND CONSTRUCTION.**

1872—February 21—Detroit and State Line Railroad Company organized under general law of Michigan.

1872—February 23—Junction Railway Company organized in Ohio.

1872—May 29—Consolidated under the name of the Toledo, Canada Southern and Detroit Railway Company.

**NAME, TITLE, AND ADDRESS OF OFFICERS.**

Name.	Office.	Address.	Salary.
James Tillingham	President	Buffalo	
C. F. Cox	Secretary	New York	
C. Vanderbilt	Treasurer	"	
M. H. Taylor	Auditor	St. Thomas, Ontario	
W. P. Taylor	General Manager	Buffalo, N. Y.	
E. P. Murray	Superintendent	Toledo, Ohio	
B. W. Gossage	Chief Engineer	St. Thomas, Ontario	
F. E. Snow	General Passenger Agent	Buffalo, N. Y.	
W. H. Perry	General Freight Agent	"	
F. E. Snow	General Ticket Agent	"	

The salaries of above officers are paid by C. S. R'y in a pro rata division.

## DIRECTORS.

Name.	Residence.	Name.	Residence.
James Tillinghast .....	Buffalo, N. Y.....	Samuel F. Barger.....	New York.....
Ed. A. Wickes.....	New York.....	Jos. Harker.....	" .....
Cornelius Vanderbilt.....	" .....	George W. Davis.....	Toledo, Ohio.....
Augustus Schell.....	" .....	W. L. Scott.....	Erie, Pa .....
Edwin D. Worcester.....	" .....		

## CAPITAL STOCK.

Capital stock authorized by law : Amount—common .....	\$2,000,000 00
Number of shares—common... 20,000	
Par value of each—common.....	100 00
Capital stock authorized by vote of company—common.....	2,000,000 00
Amount subscribed—common, 15,476. 62 shares.....	1,527,662 50
Total paid in capital stock—common, 15,476. 62 shares.....	1,527,662 50
Average amount paid in per mile of single main track (55.87 miles).....	27,701 13
Proportion of same for Ohio (8.60 miles).....	238,229 71
Capital stock issued, and on what account, as follows :	
On what account—For original construction, total number shares, 15,476.62 ; total amount of common, \$1,547,662.50.	
Stockholders, residents of Ohio, 4.	
Amount of stock held by them June 30, 1881, \$43,750.00.	
Agent authorized to transfer stock : C. F. Cox, Grand Central Depot, New York.	
Number of shares transferred within the year at such agencies, 1,953.	

## FUNDED DEBT.

Kind of bond or obligation—First mortgage ; date of issue, August 1, 1872 ; when due, January 1, 1906 ; rate of interest, 7 % ; amount of authorized issue, \$1,500,000.00 ; total amount actually issued, \$1,500,000.00.	
Average amount per mile of single main track, (55.87 miles).....	\$26,848 04
Proportion of same for Ohio (8.60 miles).....	230,893 14

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate, including past-due coupons .....		\$852,017 50
All other debts, current credit balances, etc .....		428,995 13
Total unfunded debt.....		\$1,281,012 63
Cash securities, debit balances, etc., available to payment..		13,546 51
Net unfunded debt .....		\$1,267,466 12

Average amount per mile of single main track.....	\$22,685 98
Proportion of same for Ohio.....	195,099 43
Increase since June 30, 1880 .....	44,557 76

Total net debt liabilities .....	\$2,767,466 12
Average amount per mile of single main track .....	\$49,534 03
Proportion of same for Ohio .....	425,992 65
Total of paid in stock and debt.....	\$4,315,128 62
Total average amount per mile.....	\$75,445 30
Proportion of same for Ohio .....	648,829 58

## COST OF ROAD EQUIPMENT, ETC.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1st, 1881.
Right of way and land .....		\$14,870 35	
Fencing.....		122 14	
Passenger and freight stations .....		2,488 06	
Sidings .....		24,673 37	
Total expenditures for construction....	*\$2,993,975 11	\$42,153 92	\$3,036,129 03

\*Built by contractors—no data.

## ROAD ACQUIRED BY PURCHASE.

No data as to original cost.

Total expended for construction and purchase .....	\$3,036,129 03
Average cost per mile of road constructed (single main track, 55.87 mi.)..	54,342 72
Average cost per mile of road owned by Co. (single main track, 55.87 mi.)	54,342 72
Proportion of same for Ohio (8.6 miles) .....	467,347 39

## COST OF EQUIPMENT OWNED BY COMPANY.

No equipment owned.

Real estate not included in the foregoing accounts .....	\$15,546 51
Total permanent investment.....	\$3,049,675 54
Proportion for Ohio, 8.6 miles.	
Average per mile (of single main track, 55.87 miles).....	54,585 21

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Toledo, Ohio to G. T. Junction, Mich.....	55.87 mi.	8.6 mi.
Total single main track .....	55.87 mi.	8.6
Aggregate of sidings and other tracks .....	18.67	9.25
Total length laid with rail computed as single track.....	74.54	17.85
Laid with steel rail .....	55.87	8.6
Length in Ohio, distributed as follows: No data.		

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet, 8½ in.
Grade—Maximum, per mile .....	16 feet.
Longest maximum .....	1,800 "
Aggregate length of maximum.....	2,600 "
Curvature—Shortest radius .....	1,147 "
Aggregate length of shortest radius.....	2,020 "
Aggregate length of all radii.....	16,950 "
Aggregate length of tangent.....	52.66 miles.
Rail—Steel—On road.....	55.87 "
Average weight per yard.....	60 lbs.
Ties—Average number per mile.....	2,640
Number laid during the year.....	12,785
Ballasted—On whole line .....	55.87 miles.
In Ohio .....	8.60 "
With gravel.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 1; greatest age, 9 years; aggregate length, 36 feet.	
Iron, 2; " 3 years; " 125 feet. Total, 161.	
Trestles—6; greatest age, 9 years; greatest height, 54 feet; greatest length, 4,130 feet; aggregate length, 7,204 feet.	
Length of shortest span of truss, 36 feet; of longest, 125 feet; greatest length of beams between points of support, if not trussed, 14 feet.	
Greatest space between cross ties upon bridges and trestles, 12 inches; length of ties, 9 feet.	
Number of track stringers, 7x16 inches, packed.	
Are all bridges and trestles provided with guard rails? Nearly all.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Once in three months.	
Are the examinations analytical, and are they made by a competent person? Yes.	



## FENCING—AVERAGE AND AGGREGATE COST.

	Whole line.	In Ohio.
Number miles fencing, computed as single line.....	111.77	17.20
Length of road unfenced, and the reason therefor.....		None.
No data—done during construction.		

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Chicago and Canada Southern Railroad at Slocum Junction.

Toledo and Ann Arbor Railroad at Alexis.

Number of crossings of highways at grade in this State without protection, 58.

Number of crossings of highways at grade in this State at which there are gates or flagmen, 1.

Do all trains stop at railroad crossings as required by law? Yes.

Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated.....	55.87; in Ohio, 8.60
Miles of same owned by railroad company.....	55.87; " 8.60

## STATIONS.

Passenger and freight .....	17; in Ohio.....	2
Number with telegraph communication.....	17; " .....	2
Number of same operated by railroad company .....	17; " .....	2
Is pay received for messages sent over line owned by railroad company? Yes, except for railroad business.		

## EMPLOYES.

Superintendents.....	1
Telegraph operators .....	18
Engineers.....	35
Baggagemen .....	7
Clerks .....	41
Train dispatchers.....	3
Firemen .....	36
Wipers .....	16
Mechanics.....	119
Conductors.....	21
Brakemen .....	41
Station agents .....	14
Section men.....	75
Other employees .....	81

Total number employed by company in operating line.....	578
Proportion for Ohio.....	74

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: The American Express Company.

Terms: Take freight at stations and pay one and one half regular freight rates.

Special freight and transportation lines: Canada Southern Line, Erie and North Shore Despatch, Blue Line, Merchants' Despatch Transportation Company, Hoosac Tunnel Line.

Terms as to rates, (use of track, machinery, repair of cars), etc., with each: These lines are owned by the roads for which they run. The roads receiving earnings and bearing proportion of expenses.

## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, Etc.

## EQUIPMENT AND SUPERSTRUCTURE.

Rails—Steel—Average life in years .....	12
Ties—Oak—Average life in years.....	6
Bridges—Wooden—Average life in years .....	12
Trestles—Average life in years.....	12
Fence posts—Average life in years .....	6

## ROLLING STOCK.

Terms of service: The equipment used on this road is furnished by the Canada Southern Railway Line of Canada, as required.

Number of locomotives equipped with train brakes, all.

Kind of brake: Westinghouse Air.

Number of cars equipped with train brakes, all.

Number of passenger cars with "Miller Platform", all.

Method of bridging between passenger cars, when two or more are run in trains: Miller Coupler and Platform.

Are all cars run on this road heated and lighted as prescribed by law? Yes.

State methods of heating cars used for the transportation of passengers: Baker and Smith Heater.

Means of lighting same: Candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	25 miles per hour.
Mail and accommodation .....	20 "
Freight trains .....	12 "

## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—For distances less than 8 miles ...	.03 Cts.	.03 Cts.	.03 Cts.
For distances over 8 miles—			
First class .....	.03	.03	.03
Second class .....	.02	.01 <sup>50</sup>	.01 <sup>80</sup>

Fare charged per mile—Emigrant.....	.01	.....	.01
Excursion .....	.02	.00 <sup>50</sup>	.01 <sup>25</sup>

Amount charged in addition to regular fare, in sleeping or other cars run on your road: For seat, 1.00; berth, \$2; section, \$3; state room, \$5.

## FREIGHT.

Rate per 100 lbs. per mile, when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class .....	.008 Cts.	.008 Cts.	.008 Cts.
Second class. ....	.007	.007	.007
Third class .....	.006	.006	.006
Fourth class.....	.005	.005	.005
Fifth class .....	.004	.004	.004
Special class.....	.002	.002	.002

Rate per ton per mile on freight carried less than 30 miles :

First class.....	20	11	15
Second class.....	16	09	12
Third class.....	14	07	10
Fourth class.....	12	06	08
Fifth class.....	10	05	07

Rate per ton per mile on freight carried more than 30 miles :

First class .....	10	08	09
Second class .....	086	06	07
Third class.....	063	05	06
Fourth class .....	057	04	05
Fifth class .....	04	03	03½

Rate per ton per mile for—

Limestone—Carried ten miles or more .....	07	02	04½
Carried less than ten miles.....	06	06	06

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Ballasting—Miles of main track ballasted with gravel, 5; in Ohio, 3.

Train Mileage—Passenger .....	224,275	
Freight .....	218,250	
Mixed switching .....	466,679	
Construction .....	21,239	
Total.....		930,443
Car mileage—Passenger .....	770,369	
Express and baggage.....	191,688	
Freight—loaded and empty ..	6,475,778	
Caboose .....	200,550	
Construction and other.....	260,407	
Total .....		7,898,792

## Losses, etc., paid—For injuries in Ohio, fatal and non-fatal :

To passengers.....	\$20 05	
To others.....	1,600 00	
	<hr/>	
Total .....		\$1,620 05
For animals killed in Ohio :		
2 horses.....	\$160 00	
2 cattle.....	27 50	
	<hr/>	
Total .....		\$187 50

## TRANSPORTATION.

Passengers—Total number carried, local and through .....	160,240	
Average number carried in each car per trip.....	40	
Average number of miles traveled by each.....	32	
Total mileage, or number carried one mile.....	5,127,680	
Average amount received for each.....	73.60 cents.	
Average amount <i>per mile</i> received for each.....	2.30	"
Freight—Tons carried, local, E. & W. through Canada and United States.....	94,388	
Tons carried, through.....	1,805,179	
	<hr/>	
Total. ....	1,899,567	
Total movement, or tons carried one mile.....	63,661,147	
Average amount received for each ton .....	\$1.712	
Average amount <i>per mile</i> received for each ton .....	.00511 cents.	
Average amount received for each ton through freight, E. & W. through Canada and United States.....	\$1.685	
Average amount received for each ton local freight.....	2.229	
Articles transported :	Tons.	Per cent.
Coal.....	226,181	11.90
Stone, lime, sand, etc.....	6,851	.36
Petroleum.....	2,114	.11
Ores .....	18,955	.99
Pig and bloom iron .....	36,384	01.92
Manufactured iron.....	90,302	04.76
Lumber and other forest products.....	152,649	08.04
Grain, flour, and other agricultural products .....	871,181	45.86
Live stock .....	72,009	03.79
Animal products .....	80,904	04.27
Manufactures, including agricultural implements .....	88,863	04.67
Merchandise .....	239,540	12.61
Miscellaneous .....	13,634	00.72
	<hr/>	<hr/>
Total tonnage yielding revenue.....	1,899,567	100
Supplies for Company's use.....	76,623	

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30TH.

## EARNINGS.

Passenger transportation.....	\$162,130 50
Freight transportation .....	325,247 44
Mail service.....	10,187 40
Express service.....	5,349 62
Total earnings of line operated included in this report.....	<u>\$502,914 96</u>

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$60,377 89
Maintenance of cars.....	79,181 71
Conducting transportation.....	235,880 20
General expenses, as follows:	
Taxes in Ohio.....	\$1,833 77
Michigan .....	8,681 61
Salaries.....	12,910 37
Other general expenses of operating.....	35,582 07
	<u>59,007 82</u>
Total operating expenses, being 86.39 per cent. of earnings.....	<u>\$434,447 62</u>
Net earnings of 55.87 miles operated.....	\$68,467 34
Rentals paid, etc.:	
Detroit and Toledo, etc ..	\$18,217 03
Engine, car service.....	37,018 14
	<u>55,235 17</u>
Net income over operating expenses and rents paid.....	\$13,232 17
Percentage of same to capital stock and debt, $\frac{3}{100}$ of 1 per cent.	
Per centage of to total means applied to construction, etc., $\frac{43}{100}$ of 1 per cent.	
Per mile of earnings.....	\$9,001 52; Proportion for Ohio (8.60 miles) \$77,413 07
operating expenses	8,764 68; 75,376 25
net earnings .....	236 84; 2,036 82

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Increase of floating debt .....	\$130,112 33
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Construction of new work.....	\$42,153 92
Increase of unfunded debt.....	87,958 31
	<u>\$130,112 23</u>

CONDENSED GENERAL BALANCE SHEET JULY 1, 1881.

LIABILITIES.

Capital stock.....	\$1,547,662 50	
Funded debt, 1st mortgage bonds .....	1,500,000 00	
Mortgage bonds, scrip.....	\$11,737 50	
Interest unpaid.....	840,280 00	
C. S. R'y line.....	428,995 13	
	<hr/>	1,281,012 63
		<hr/>
		\$4,328,675 13

ASSETS.

Construction .....	\$3,036,129 03	
Real estate .....	13,546 51	
Income .....	1,278,999 59	
	<hr/>	\$4,328,675 13

SUMMARY OF ACCIDENTS.

PERSONS KILLED—CAUSES.

Employes—Coupling, or crushed between cars and engine.....	1
Others—Riding or driving across track.....	1
	<hr/>
Total .....	2

PERSONS INJURED—CAUSES.

Others—Getting on or off engine or train in motion .....	1
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RECAPITULATION.

Killed—Employes—from causes beyond their control.....	1
Others—At stations and highway crossings .....	1
	<hr/>
Total killed.....	2
Injured—Others—stealing rides .....	1
	<hr/>
Total injured.....	1

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	1880, Nov. 15	Myron Harrington, of Jetersburg, Mich.....	Citizen .....	While asleep in wagon, which was standing on track at Lagrange St. crossing, Toledo, O., was struck by engine of special train. Mr. H. being at the time apparently under the influence of liquor.....	Instantly killed; coroner's inquest exonerated company from all blame.
2	Dec. 5	D. Lee .....	Employe; yard brakeman .....	Whilst Lee was endeavoring to couple two cars of railroad iron at Grosse Isle, Mich., had his head caught between ends of rails and severely crushed .....	Died night of Dec. 11, '81; no inquest.
3	1881. Mch. 23, 5 P.M.	Known as Frank Dennis; real name, Isery Hastings .....	School-boy .....	In attempting to jump on freight train No. 27, at Slocum Junction, Mich., while train was in motion, fell partially under train .....	Train passed over one limb.

*State of New York, City and County of New York, ss.:*

I, Charles F. Cox, Secretary of the Toledo, Canada Southern and Detroit Railway Company, being duly sworn, depose and say that I caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declare them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D., 1881, to the best of my knowledge and belief.

(Signed)

[SEAL OF R. R.]

C. F. COX,

*Secretary.*

Subscribed and sworn to before me, this 2d day of September A. D. 1881.

[SEAL.]

DWIGHT W. PARDEE,

*Commissioner for Ohio, residing in New York.*



## TOLEDO, DELPHOS AND BURLINGTON RAILROAD COMPANY.

Name of road : The Toledo, Delphos and Burlington Railroad.

By whom owned : The Toledo, Delphos and Burlington Railroad Company.

By whom operated : The Toledo, Delphos and Burlington Railroad Company.

By what authority : Consolidated with Dayton and Southeastern Railroad Company.

Name of company making this report : The Toledo, Delphos and Burlington Railroad Company.

General office at Toledo, Ohio.

Principal office in Ohio at Toledo, Ohio.

Address correspondence relating to this report to Herbert Steward, Secretary, at 74 Broadway, New York City.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

On the 4th of March, 1881, the directors of the old Toledo, Delphos and Burlington Railroad Company entered into a contract of consolidation with the Dayton and Southeastern Railroad Company, which contract was ratified by the stockholders of the former company March 17, 1881, and by the stockholders of the latter company March 15, 1881.

The new organization was completed by the election of directors and other officers April 12, 1881.

By the terms of the consolidation the new company retains the name of the Toledo, Delphos and Burlington Railroad Company, with a capital of \$7,000,000.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Jno. M. Corse .....	President .....	74 Broadway, N. Y.....	
Herbert Steward .....	Secretary .....	" " .....	
" .....	Treasurer .....	" " .....	
J. W. McElvaine .....	Auditor .....	Toledo, Ohio.....	
R. G. Butler.....	General Manager .....	" .....	
W. J. Sherman .....	Chief Engineer .....	" .....	
E. L. Lomax.....	General Passenger Agent..	" .....	
T. W. Lippincott .....	General Freight Agent .....	" .....	
E. L. Lomax .....	General Ticket Agent .....	" .....	
C. S. Brice.....	Executive Committee..	Lima, Ohio .....	
Geo. W. Ballou .....		New York.....	
Jno. M. Corse .....		" .....	
W. H. Sloan.....		Toledo, Ohio .....	
N. McKinnon .....		" .....	

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Geo. T. Riley.....	Boston .....	Geo. W. Kneisley .....	Dayton, O.
Jas. W. Brown .....	" .....	Milton Taylor .....	Toledo, O.
Wm. A. Haskel .....	" .....	Almon Hall.....	"
Geo. Wm. Ballou.....	New York.....	Neil McKinnon .....	"
Calvin S. Brice .....	Lima, O .....	Wm. H. Sloan.....	"
Jno. M. Corse .....	New York.....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$7,000,000 00
Number of shares—common.....	140,000
Par value of each—common.....	\$50 00
Increase since June 30, 1880—common.....	3,000,000 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$7,000,000 00
Amount subscribed—common .....	6,839,950 00
Total paid in capital stock—common .....	4,355,350 00

Stockholders, residents of Ohio, 1,349.

Amount of stock held by them June 30, 1881, \$423,750.

Agents authorized to transfer stock: The company transfers its stock at its office,  
74 Broadway, New York.

Number of shares transferred within the year at such agencies, 112,237.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
First mortgage.....	Main line.....	Jan., 1880	Jan., 1910	6	\$1,250,000 00	\$1,250,000 00
" .....	Dayton Div.....	July, 1880	Apr., 1910	6	1,000,000 00	1,000,000 00
" .....	Southeastern Div .....	May, 1881	Apr., 1921	6	2,250,000 00	.....
" .....	Cincinnati Div ..	" .....	" .....	6	250,000 00	.....
" .....	Tol. Term. Trust ..	July, 1880	July, 1910	6	250,000 00	100,000 00
Income mortgage .....	Main line.....	Jan., 1880	Jan., 1910	6	1,250,000 00	1,250,000 00
" .....	Dayton Div .....	July, 1880	Apr., 1910	6	1,000,000 00	1,000,000 00
" .....	Southeastern Div ..	May, 1881	" 1921	6	2,250,000 00	.....
" .....	Cincinnati Div ..	" .....	" 1921	6	250,000 00	.....

## COST OF ROAD EQUIPMENT, Etc.

No details can be given, as the road has been acquired by consolidation by contract.

## CHARACTERISTICS, ETC.

## PROPOSED LINES.

From Toledo via Delphos to Kokomo.....	181 miles.
From Delphos via Dayton to Wellston and Ironton.....	267.19 "
From Shakertown to Utica .....	17 "
Total.....	465.19 mi.
Length graded, not laid with rail .....	38.64 mi.
Proposed gauge, 36 inches.	

## LINE IN OPERATION.

	Length.	In Ohio.
Single main track—Toledo to Kokomo, Ind.....	181. miles	100. miles.
Delphos to Dayton .....	94.9 "	94.9 "
Mercer to Shane's Crossing .....	4. "	4. "
Dayton to Wellston .....	115.5 "	115.5 "
Total single main track.....	395.4 "	314.4 "
Aggregate of sidings and other tracks.....	22.2 "	16.2 "
Total length laid with rail computed as single track .....	417.6 "	330.6 "
Laid with steel rail .....	7. "	7. "

Length in Ohio distributed as follows:

County.	Main track.	Branches.	Sidings, etc.	Total.
Lucas .....	25.70		2.23	27.93
Wood .....	.75		.44	1.19
Henry .....	26.82		.89	27.71
Putnam .....	23.30		1.09	24.39
Allen .....	14.20		1.47	15.67
Mercer .....	30.21	4.	.52	34.93
Van Wert.....	28.20		1.01	29.21
Darke .....	9.18		.20	9.38
Montgomery .....	23.50		1.46	24.96
Miami .....	21.43		.35	21.78
Greene .....	26.46		1.01	27.47
Fayette .....	22.89		1.07	23.96
Ross .....	38.83		1.67	40.50
Vinton .....	4.30		.12	4.42
Jackson ..	14.63		2.70	17.32
Totals.....	310.40	4.	16.23	330.63

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	3 feet.
Grade—Maximum, per mile .....	3,090 "
Longest maximum.....	1,000 "
Aggregate length of maximum .....	1,000 "

Curvature—Shortest radius.....	300 feet.
Aggregate length of shortest radius.....	350 "
Aggregate length of tangent .....	385 miles.
Rail—Iron—On road.....	307.4 "
Average weight per yard.....	35 lbs.
Steel—On road .....	7 miles.
Average weight per yard.....	40 lbs.
Ties—Average number per mile .....	2,800
Number laid during the year.....	About 5,000
Ballasted—On whole line.....	228 miles.
In Ohio.....	210 "
With gravel, stone and sand.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 16; greatest age, 4 years; aggregate length .....	3,293 feet.
Combination, 1; aggregate length.....	100 "

Total ..... 3,393 "

— Trestles—...; greatest age, 4 years; greatest height, 30 feet; greatest length, 1,908; aggregate length, 14,811 feet.

Length of shortest span of truss, 40 feet; of longest, 160 feet; greatest length of beams between points of support, if not trussed, 18 feet.

Greatest space between cross ties upon bridges and trestles, 8 inches; length of ties, 6 to 8 feet.

Number of track stringers, 2 and 4.

Are all bridges and trestles provided with guard rails? Nearly.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent person? Yes.

## FENCING.

Some fencing has been done by the company, and arrangements are being made for more.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

C., C., C. & I. at Versailles.

C., C. & I. C. at Covington.

" " at Dayton.

P., C. & St. L. at Xenia and Dayton.

Home Avenue R. R. at Dayton.

C., H. & D. at Dayton.

C. & M. Valley R. R. at Washington C. H.

Ohio Southern at

"

Coalton.

Marietta & Cincinnati at Musselman's.

Scioto Valley R. R. at Chillicothe.

Canada Southern R. R. at Toledo.

Baltimore & Ohio R. R. at Holgate.

P., Ft. W. & C. R'y at Delphos.

Lake Erie & Western R'y at Celina.

P., C. & St. L. R'y at Stillwater Junction.

Cin., Van Wert & Indianapolis R. R. at Enterprise.

What railroads cross your road either over or under your grade in this State, and where?

Wabash, St. Louis & Pacific R. R. at Toledo.

L. S. & M. S. R. R. at Toledo.

P., C. & St. L. R'y between Dayton and Xenia.

Number of crossings of highways at grade in this State without protection. A good many.

Number at which there are gates or flagmen. Nearly all in cities.

Number of crossings of highways over railroad. About 6.

" " " under railroad, 1.

Number of highway bridges 18 feet above track, 1.

Number of highway bridges less than 18 feet above track. None.

Do all trains stop at R. R. crossings as required by law? Yes.

Are flagmen stationed at each? At most.

## STATIONS AND TELEGRAPH.

### TELEGRAPH LINE.

Miles on line of road operated, 469—in Ohio ..... 388

### STATIONS.

Passenger and freight ..... 88; in Ohio, 67

Number with telegraph communication ..... 46; " 35

Is pay received for messages sent over line owned by railroad company? No.

## ROLLING STOCK.

Locomotives..... 34; average weight, lbs..... 51,170

Express and baggage cars..... 8; " ..... 22,000

Passenger cars ..... 15; " ..... 25,000

Freight cars..... 1,063; " ..... 10,670

Other cars..... 6; " ..... 23,000

Freight car trucks ..... 260;

Above includes not owned by company reporting.

Locomotives.....	27; owned by Boston Car Trust.
Express and baggage cars .....	4; " "
Passenger cars.....	11; " "
Freight cars .....	759; " Clark, Post & Martin.
Other cars.....	6; " "
Freight car trucks .....	200; " "
Number of locomotives equipped with train brakes, 6.	
Kind of brake: Westinghouse automatic.	
Number of cars equipped with train brakes, 19.	
Kind: Westinghouse automatic.	
Number of passenger cars with Miller Platform, 19.	
Method of bridging between passenger cars, when two or more are run in trains:	
Miller Platform and couplers.	
Are all cars run on this road heated and lighted as prescribed by law? Yes.	
State methods of heating cars used for the transportation of passengers: Heated with Spear Stoves, using anthracite or bituminous coal.	
Means of lighting same: Lighted with most approved makes of lamps, using mineral sperm oil.	

SPEED OF TRAINS.

Express passenger, average rate, including stops .....	18 miles per hour.
Mail and accommodation, " .....	18 "
Freight trains, " .....	6 "

EMPLOYES.

Superintendents.....	1
Telegraph operators .....	10
Engineers .....	27
Baggagemen .....	7
Flagmen, switch-tenders and watchmen.....	13
Laborers.....	180
Clerks .....	23
Train dispatchers .....	3
Firemen .....	27
Wipers.....	15
Mechanics .....	90
Conductors.....	22
Brakemen.....	53
Station agents .....	82
Section men .....	682
Other employees.....	15

Total number employed by company in operating line.....	1,250
Proportion for Ohio.....	1,000

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: American express, Toledo to Dayton and Dayton to Kokomo, Indiana. United States express, same.

Terms: Each pay \$25 per day.

Locomotives, cars, rails, ties, bridges, etc., new.

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—	Highest.	Lowest.	Average.
For distances less than 8 miles.....	.06 Cts.	.03 Cts.	.04½ Cts.
For distances over 8 miles—First class.....	.03	.03	.03

## FREIGHT.

Rate per 100 lbs. per mile when freight weighs less than a ton:

	Highest.	Lowest.
First class .....	.04 Cts.	.023 Cts.
Second class.....	.032	.019
Third class .....	.024	.016
Fourth class.....	.02	.012
Fifth class.....	.015	.007
Special class .....	.016	.006
Rate per ton per mile for—		
Coal—Carried ten miles or more .....	.154 Cts.	.07 Cts.
Carried less than ten miles .....	.166	.058
Pig iron—Carried ten miles or more .....	.19	.10
Carried less than ten miles .....	.32	.10
Limestone—Carried ten miles or more.....	.154	.07
Carried less than ten miles.....	.166	.058
Iron ore—Carried ten miles or more .....	.19	.10
Carried less than ten miles.....	.32	.10
Undressed stone or lumber—Carried ten miles or more..	.154	.07
Carried less than ten miles .....	.166	.058

## DOINGS OF THE YEAR ENDING JUNE 30.

Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length.
Toledo .....	Swan Creek.....	Wood .....	440 feet.
South Toledo.....	M. and E. canal ...	" .....	118 "
Grand Rapids .....	Maumee canal ....	" .....	900 "

The above are all Howe trusses.

Trestles built in Ohio—Length filled and converted into embankment, 200 feet.

Fencing in Ohio—Miles of single fence built: Very little.

Grading—Miles of main track graded: Mercer to Versailles and Indiana, 73; in O., 33

Ballasting—Miles of main track ballasted, with sand, 34, stone, 2, gravel,

30..... 71; “ 66

Rail laid—Steel, 40 lbs. per yard—miles of track..... 7; “ 7

New iron, 35 and 40 lbs. per yard—miles of track ..... 67; ...

Train mileage—Passenger ..... 167,129

Freight ..... 111,990

Total..... 279,119

Mixed—Included above. Construction—Not kept.

Car mileage—Passenger... .. 263,298

Express and baggage ..... 131,881

Freight—loaded..... 828,052

empty..... 425,629

Total..... 1,648,860

Caboose, construction and other—No record.

Fuel consumed—Wood, 2,216 cords; coal, 5,055½ tons; total cost..... \$17,384 29

Losses, etc., paid—On goods and baggage ..... 266 55

For injuries in Ohio, fatal and non-fatal..... 151 16

For animals killed in Ohio..... 77 50

#### TRANSPORTATION.

Passengers—Total number carried..... 118,337

Average number of miles traveled by each..... 21

Total mileage, or number carried one mile..... 2,467,718

Average amount received for each..... 57 cents.

Average amount *per mile* received for each ..... 2.75 “

Freight—Total tons carried..... 149,443

Total movement, or tons carried one mile ..... 4,765,718

Average amount received for each ton..... 87 c.

Average amount *per mile* received for each ton ..... 2.73 c.

Average cost per ton freight per mile ..... 3.1

Articles transported:

	Tons.	Per cent.
Coal .....	11,249	7.5
Stone, lime, sand, etc.....	9,271	6.2
Petroleum .....	40	.....
Manufactured iron.....	3,701	2.5
Lumber and other forest products.....	80,352	53.8
Grain, flour, and other agricultural products.....	24,065	16.1
Live stock .....	1,409	1.0
Animal products.....	683	.5
Manufactures, including agricultural implements.....	1,098	.7
Merchandise .....	9,891	6.6
Miscellaneous .....	7,594	5.1

Total tonnage yielding revenue ..... 149,443 100



## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30TH, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.	Character of injury.
1	Nov. 28	Frank Donald.....	Brakeman.....	Fell from train.....	Bruised limb.
2	Dec. 6	Harry Pike.....	Warehouseman...	Coupling cars; own carelessness.....	Lost thumb on left hand.
3	8	Chas. Lindeman...	Not known.....	Walking on track; company exonerated by coroner...	Killed.
4	21	Wm. Hayes.....	Section man.....	On track drunk.....	Bruised.
5	28	Sam'l Park.....	Farmer.....	Horse frightened at hand-car.....	Bruised on arm.
6	Mch 10	R. N. Lawrence.....	Brakeman.....	Carelessness coupling cars.....	Hand mashed.
7	16	Jas. S. Feet.....	Fireman.....	Fell from engine tank.....	Bruised about head.
8	21	David Simmonds...	Brakeman.....	Broken spring in car drawhead.....	Finger bone fractured.
9	Apr. 9	David Kreutch.....	".....	Fell from top of car.....	Bruised on leg.
10	May 10	Jas. McCarty.....	Section foreman...	Hand-car jumped track, throwing him off.....	Bruised leg.
11	June 17	D. L. Irvine.....	Not known.....	Misplaced switch, throwing train from track.....	Bruised.
12	23	Chas. McLaughlin...	".....	Lying on track, drunk.....	Killed by pay-train.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Others—Lying, walking, falling, or being on track .....	2
Total.....	2

## PERSONS INJURED—CAUSES.

Employees—Coupling, or caught between cars and engine.....	2
Falling or thrown from engine or train.....	3
Lying, walking, falling, or being on track .....	1
Engine or train leaving or thrown from track.....	2
Others—Driving or riding across track.....	1
Total.....	9

## RECAPITULATION.

Killed—Others—trespassing, on track, etc.....	2
Total killed.....	2
Injured—Employees—misconduct or want of caution .....	8
Others—at stations and highway crossings .....	1
Total injured.....	9

## TRAIN ACCIDENTS—ENTIRE LINE.

No.	Date.	Place.	Character of train	Cause of accident.	Effect of accident.
1	Jan. 19	Buckeye.....	Freight.....	Car jumped track.....	Ditched 2 cars of stores.
2	19	Holgate.....	Wild.....	" " " ".....	Broke 2 springs, one car.
3	20	Buckeye.....	Freight.....	" " " ".....	Ditched 2 cars badly.
4	24	N'r Spencerville.....	".....	" " " ".....	No damage.
5	27	Near Marion.....	".....	Road spread—car off.....	"
6	27	" Celina.....	".....	Cylinder head blew out of engine.....	"
7	Feb. 8	" Bluffton.....	".....	Bad track—car off.....	3 journal boxes broken.
8	12	" N. Bavaria.....	".....	Railing car onto siding.....	Track, frame and engine broken.
9	12	" Bluffton.....	Passenger.....	Broken pedestal bolt on engine.....	1 shoe and 1 bolt broken.
10	17	Holgate.....	".....	Tank truck jumped track.....	Baggage car ditched.
11	21	Toledo.....	".....	Bad switch.....	Engine and 3 cars ditched.
12	26	Presque Isle.....	".....	Track obstructed.....	Coach step broken.
13	Mch. 8	Enterprise.....	".....	Backed into by train on Cow on street crossing.....	Side of baggage car mashed.
14	11	Delphos.....	Freight.....	Broken box on car track.....	1 pair trucks broken.
15	17	Grand Rapids.....	Passenger.....	Axle broke under tank.....	Axle broken.
16	20	L. Centre.....	Wild.....	Track spread.....	1 car ditched.
17	21	Mercer.....	Freight.....	Bad curve.....	2 cars off.
18	22	Presque Isle.....	Gravel train.....	Engine jumped track.....	3 cars wrecked.
19	24	Decatur.....	Passenger.....	Unknown.....	1 car off.
20	28	Imbry Siding.....	Freight.....	Car loaded too heavy.....	Broken truck.
21	28	Bluffton.....	Passenger.....	Tank truck jumped track.....	" tank truck.
22	30	Holgate.....	".....	Bad track.....	" " "
23	31	Curryville.....	".....	Engine jumped track.....	No damage.
24	Apr. 4	Warren.....	".....	Bad track.....	Track casting broke.
25	4	Delphos.....	Freight.....	Car overloaded.....	Brake beam
26	9	Grelton.....	".....	Car jumped track.....	3 cars ditched.
27	18	Boehmer.....	Passenger.....	Bad track.....	Brake beam broken.
28	20	Waterville.....	".....	Defect in switch.....	Feed pipe on engine broken.
29	21	Moutana.....	".....	Broken axle box.....	Truck box broken.
30	23	City Park.....	".....	Bad curve.....	Broken pedestal jaw.
31	30	S. Toledo.....	Freight.....	Run over stock.....	7 cars ditched.
32	May 7	Presque Isle.....	".....	Overloaded car.....	Centre bearing broke.
33	17	Mercer.....	".....	Unknown.....	Engine col. broken.
34	24	Mendon.....	".....	Heavy loaded car.....	1 car wrecked.
35	June 15	Bluffton.....	Passenger.....	Low joint.....	1 car off.
36	17	Delphos.....	".....	Misplaced switch.....	2 cars off.
37	26	Marion.....	Sand train.....	Side rod on engine broke.....	Broken side rod.

## SUMMARY OF TRAIN ACCIDENTS.

## Number:

Accidents causing derailment of trains.....	18
Accidents not resulting in derailment of train .....	18
Collisions—crossing.....	1

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Total accidents.....	37
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## Causes of accidents effecting derailment of trains:

Cattle on track.....	1
Loose switch.....	1
Misplaced switch.....	1
Spreading of rails.....	2
Unexplained.....	5
Other causes.....	8

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Total.....	18
------------	----

## Causes of collisions:

Signals—failure to use, or absence of.....	1
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## Causes of accidents not resulting in derailment of trains:

Accidental obstruction.....	1
Broken connecting rod .....	1
Broken axle.....	1
Cylinder head burst or blown out.....	1
Other causes.....	14

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Total.....	18
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Total derailments .....	18
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Total collisions .....	1
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Total accidents .....	37
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*State of Ohio, County of Lucas, ss.:*

Jno. M. Corse, President of the Toledo, Delphos and Burlington Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

JNO. M. CORSE,

*President.*

Subscribed and sworn to before me, this 21st day of December, A. D. 1881.

[SEAL.]

CLEMENT CARPENTER,

*Notary Public, Lucas county, O.*

## VALLEY RAILWAY COMPANY.

Name of road: Valley Railway.

By whom owned: Valley Railway Company.

By whom operated: Valley Railway Company.

Name of company making this report: Valley Railway Company.

General office at 122 Water street, Cleveland, O.

Principal office in Ohio at 122 Water street, Cleveland, O.

Address correspondence relating to this report to Wm. B. Porter, Secretary and Auditor, at 122 Water street, Cleveland, O.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. H. Wade .....	President.....	Cleveland.....	.....
S. T. Everett .....	Vice President.....	" .....	.....
W. B. Porter .....	Secretary .....	" .....	.....
S. T. Everett .....	Treasurer .....	" .....	.....
Wm. B. Porter .....	Auditor .....	" .....	.....
Sam. Briggs .....	{ General Superintendent..	" .....	.....
	{ General Passenger Agent	" .....	.....
	{ General Freight Agent...	" .....	.....
Jas. E. Turk.....	Chief Engineer.....	" .....	.....
J. H. Wade .....	} Executive Committee.. }	.....	.....
S. T. Everett.....		.....	.....
H. B. Payne.....		.....	.....
W. J. Boardman.....		.....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
J. H. Wade.....	Cleveland .....	W. J. Boardman.....	Cleveland.
S. T. Everett .....	" .....	D. L. King.....	Akron.
H. B. Payne.....	" .....	L. V. Bockins.....	Canton.
John Tod .....	" .....	A. M. Flaglar.....	New York.
L. M. Coe.....	" .....		

### CAPITAL STOCK.

#### CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$6,500,000 00
Number of shares—common.....	130,000 00
Par value of each—common.....	\$50 00

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount subscribed—common, including conditional .....	\$921,400 00
Total paid in capital stock—common .....	761,036 27
Increase since June 30, 1880—common.....	4,578 34
Average amount paid in per mile of single main track (58.7 miles).....	12,964 84
Proportion of same for Ohio, all.	

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For subscriptions paid in cash—Number shares, 14,517; amount of common, \$725,850.00.

Stockholders, residents of Ohio, 904.

Amount of stock held by them June 30, 1881, \$705,640.00.

Agents authorized to transfer stock: Wm. B. Porter, Secretary, Cleveland, O.

Number of shares transferred within the year at such agencies, 832.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage, gold bond.....	Mortgage.....	June 15, 1879	June 15, 1906	7	\$1,600,000 00	\$1,600,000 00
Accrued interest on bonds.....						164,881 50
Total .....						\$1,764,881 50

Average amount per mile of single main track (58.7 miles)..... \$30,066 13

Proportion of same for Ohio, all.

Increase since June 30, 1880..... 155,206 50

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate .....	\$54,675 57
All other debts, current credit balances, etc.....	43,042 28
Total unfunded debt.....	97,717 85
Cash securities, debit balances, etc., available to payment..	32,794 63
Net unfunded debt .....	\$64,923 22
Average amount per mile of single main track.....	\$3,071 20
Increase since June 30, 1880.....	152,944 24
Total net debt liabilities.....	1,829,804 72
Average amount per mile of single main track .....	31,172 14
Total of paid in stock and debt. ....	2,590,840 99
Total average amount per mile.....	\$44,136 98
Proportion of same for Ohio.....	All.

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1st, 1880.	Expenditures for the year ending June 30th, 1881.	Total expendi- tures to July 1st, 1881.
Right of way.....	\$405,528 75	\$3,145 52	\$408,674 27
Civil engineering .....	68,083 74	3,176 80	71,260 54
Grading and masonry.....	704,781 97	37,145 76	741,927 73
Bridges.....	79,454 11	4,562 67	84,016 78
Timber and ties .....	99,608 94	5,356 14	104,965 08
Track laying.....	16,480 98	3,929 81	20,410 79
Iron rails, chairs and spikes .....	214,069 42	33,788 82	247,858 24
Fencing.....	3,419 27	6,295 40	9,714 67
Passenger and freight stations.....	15,882 43	7,247 78	23,130 21
Engine and car houses.....	3,671 74	8,575 45	12,247 19
Machine shops, machinery and fixtures	324 17	16,350 71	16,674 88
Other buildings and fixtures.....	19,128 01	18,799 30	37,927 31
Telegraph.....	2,062 41	296 44	2,358 85
Steel rails.....	75,200 68		75,200 68
Interest and discount.....	478,455 42	12,932 99	491,388 41
Contingent expenses .....	119,624 23	7,232 57	126,856 80
Total expenditures for construction...	\$2,305,776 27	\$168,836 16	\$2,474,612 43

Total expended for construction and purchase.....	\$2,474,612 43
Average cost per mile of road owned by company (single main track, 58.7 miles).....	42,156 94

## COST OF EQUIPMENT OWNED BY COMPANY.

Locomotives, 7 .....	\$48,885 02
First-class passenger cars, 5 .....	17,417 28
Box freight cars and platform cars, 150.....	68,793 41
Baggage cars, 2.....	2,000 00
Total cost of railroad equipment owned by company .....	\$137,095 71
Average amount per mile (of single main track, 58.7 miles)...	\$2,335 53
Total for road and equipment .....	2,611,708 14
Total average amount per mile (of single main track, 58.7 mi.)	\$44,492 47
Total permanent investment.....	2,611,708 14
Average per mile (of single main track, 58.7 miles).....	\$44,492 47

## CHARACTERISTICS, Etc.

## PROPOSED LINE.

From Canton via Mineral Point to One Leg Creek, 17 miles.  
Proposed gauge, 4 feet, 8 $\frac{3}{4}$  inches.

## LINE IN OPERATION.

	Length.
Single main track, Cleveland to Canton .....	58.7
Aggregate of sidings and other tracks .....	10.81

Total length laid with rail computed as single track.....	71.51
Laid with steel rail.....	17.
Length in Ohio, distributed as follows:	

County.	Main track.	Sidings, etc.	Total.
Cuyahoga.....	19.02	5.59	24.61
Summit.....	31.04	5.29	36.33
Stark.....	8.64	1.93	10.57
Totals.....	58.7	12.81	71.51
Steel rail.....	17.		

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft. 8 $\frac{3}{4}$ in.
Grade—Maximum, per mile .....	40 feet.
Longest maximum .....	8 miles.
Aggregate length of maximum .....	8 "
Curvature—Shortest radius.....	1,042 feet.
Aggregate length of shortest radius.....	500 "
Aggregate length of all radii.....	25.3 "
Aggregate length of tangent.....	33.4 miles.
Rail—Iron—On road.....	54.51 miles.
Average weight per yard .....	56 lbs.
Steel—On road .....	17 miles.
Average weight per yard .....	56 lbs.
Ties—Average number per mile.....	2,600
Number laid during the year.....	4,000
Ballasted—On whole line .....	58.7 miles
In Ohio, with gravel.....	58.7 "

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 20; greatest age, 6 years; aggregate length, 1,100 feet.	
Iron, 1; greatest age, 3 years; aggregate length, 170 feet.	
Combination, 19; *534 feet.	
Stone arch, 3; *240 feet. Total, 2,044 feet.	
Trestles—5; greatest age, 6 years; greatest height, 45 feet; greatest length, 1,072; aggregate length, 2,423.	
Length of shortest span of truss, 16 feet; of longest, 100; greatest length of beams between points of support, if not trussed, 16 ft.	

\* See report of 1880.

Greatest space between cross ties upon bridges and trestles, 12 inches;  
length of ties, 8 to 10 ft.

Number of track-stringers, 4.

Are all bridges and trestles provided with guard rails? Yes, except 4.

Do all bridges and trestles receive stated examinations? Yes.

How often? Monthly.

Are the examinations analytical, and are they made by a competent person? Yes.

Tunnels—Brick, one at East Akron.

#### FENCING—AVERAGE AND AGGREGATE COST.

Number miles fencing, computed as single line, whole line, 29 miles.

Kind of fencing, as follows:

Post and board (average cost per rod, \$1.25), 1 mile.

Wire (average cost per rod, 70 cents), 28 miles.

Average cost of fencing, \$9,714.67.

Average cost of same per rod, 72 cents.

Length of road unfenced, and the reason therefor, 44.

Fencing is being done as rapidly as possible.

#### CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Pittsburgh, Ft. Wayne and Chicago Railroad at Canton.

What railroads cross your road either over or under your grade in this State, and where?

Cleveland, Columbus, Cincinnati and Indianapolis Railroad at Cleveland.

New York, Pennsylvania and Ohio Railroad at Cleveland and Akron.

Cleveland, Mt. Vernon and Columbus Railroad at Akron.

Number of crossings of highways under railroad, 3.

Do all trains stop at railroad crossings as required by law? They do at grade crossings.

Are flagmen stationed at each? There are.

#### STATIONS AND TELEGRAPH.

##### TELEGRAPH LINE.

Miles on line of road operated—in Ohio.....	59
Miles of same owned by Valley Railway and Western Union jointly—in Ohio.....	59

##### STATIONS.

Passenger and freight.....	21—17 passenger, 4 freight.
Number with telegraph communication.....	17—15 “ 2 “
Number of same operated by railroad company, all.	
Is pay received for messages sent over line owned by railroad company? No.	



## ROLLING STOCK.

Locomotives.....	12 ; average weight, lbs.....	93,600
Express and baggage cars.....	2	
Passenger cars.....	15	
Freight cars.....	306	

Above includes not owned by company reporting.

Locomotives, 5, owned by W. S. Jones, with whom we contract for purchase of same.

Pass'ger cars, 10, " " " " " "

Freight cars, 156, " " " " " "

Number of locomotives equipped with train brakes, 4.

Kind of brake: Westinghouse Automatic.

Number of cars equipped with train brakes, 17.

Kind: Westinghouse Automatic.

Number of passenger cars with "Miller Platform", 15.

Method of bridging between passenger cars, when two or more are run in trains:

No bridges.

Are all cars run on this road heated and lighted as prescribed by law? They are.

State methods of heating cars used for transportation of passengers: Winslow's

Safety Car Stove.

Means of lighting same: 300° oil and candles.

## SPEED OF TRAINS.

Express passenger, average rate, including stops .....	} 24 miles per hour.
Mail and accommodation.....	
Freight trains .....	10 "

## EMPLOYEES.

Superintendents.....	1
Telegraph operators .....	7
Engineers.....	10
Baggagemen .....	5
Flagmen, switch-tenders and watchmen .....	5
Laborers .....	12
Clerks .....	12
Train dispatchers.....	1
Firemen .....	11
Wipers.....	6
Mechanics .....	26
Conductors .....	8
Brakemen .....	18
Station agents and operators.....	16
Section men.....	72
Other employees .....	15

Total number employed by company in operating line..... 225

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Union Express.

Terms: Forty per cent. of receipts.

## RATES OF TRANSPORTATION.

## PASSENGERS.

Fare charged per mile—	Highest.	Lowest.	Average.
For distances less than 8 miles.....	5 Cts.	3 Cts.	3 Cts.
For distances over 8 miles—1st class.....	3	2.6	2 $\frac{3}{4}$
Excursion .....	2	1	1 $\frac{1}{2}$

## FREIGHT.

Rate per 100 lbs. per mile when freight weighs less than a ton :

	Highest.	Lowest.	Average.
First class .....	3 $\frac{3}{4}$ Cts.	$\frac{1}{4}$ Cts.	1 $\frac{1}{2}$ Cts.
Second class .....	3 $\frac{3}{4}$	$\frac{1}{4}$	1 $\frac{1}{2}$
Third class .....	3 $\frac{1}{4}$	$\frac{1}{4}$	1 $\frac{1}{2}$
Fourth class .....	2 $\frac{1}{2}$	$\frac{1}{6}$	1 $\frac{1}{2}$
Fifth class.....	2 $\frac{1}{4}$	$\frac{1}{6}$	1
Special class ..	2	$\frac{1}{10}$	1

Rate per ton per mile on freight carried less than 30 miles :

First class .....	15	5	7
Second class.....	14	5	7
Third class .....	12	5	7
Fourth class .....	12	5	6
Fifth class.....	10	4 $\frac{1}{2}$	5
Special class.....	10	3	5

Rate per ton per mile on freight carried more than 30 miles:

First class .....	5	5	5
Second class.....	5	4 $\frac{1}{2}$	4 $\frac{1}{2}$
Third class .....	5	4 $\frac{1}{2}$	4 $\frac{1}{2}$
Fourth class .....	5	3 $\frac{1}{2}$	4
Fifth class.....	5	3	3 $\frac{1}{2}$
Special class.....	4	3	3 $\frac{1}{2}$

Rate per ton per mile for—

Coal—Carried 10 miles or more .....	4	1 $\frac{1}{4}$	1 $\frac{1}{2}$
Carried less than 10 miles .....	7	3	5
Pig iron—Carried 10 miles or more.....	5	1 $\frac{1}{4}$	2
Carried less than 10 miles.....	10	3	5
Limestone—Carried ten miles or more.....	5	2	3
Carried less than ten miles.....	10	3	5
Iron Ore—Carried ten miles or more.....	5	1 $\frac{1}{4}$	2
Carried less than 10 miles.....	10	3	5
Undressed stone or lumber—Carried 10 miles or more...	4	1 $\frac{1}{4}$	$\frac{1}{2}$
Carried less than 10 miles..	7	3	5

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows :

Location or how designated.	Construction.	Material.	Length.
Kingsburg run.....	Stringer.....	Wood.....	19 feet.
Cuyahoga river .....	Howe truss.....		148 "
Ohio canal .....	" .....	Wood .....	110 "
Ohio canal .....	" .....	" .....	75 "
Furnace run.....	" .....	" .....	93 "
Little Cuyahoga .....	" .....	" .....	68 "

Fencing in Ohio—Miles of single fence built (average cost per rod, 72c.).....	19
Grading—Miles of main track graded—in Ohio.....	$\frac{3}{4}$
Ballasting—Miles of main track ballasted with gravel.....	10
Rail laid—Steel, 56 lbs. per yard—miles of track.....	$\frac{1}{4}$
New iron—miles of track .....	6
Train mileage—Passenger .....	45,158
Freight .....	30,421
Total.....	75,579
Car mileage—Passenger.....	136,764
Express and baggage .....	45,158
Freight—loaded and empty. ....	450,995
Caboose .....	30,421
Total.....	663,338
Fuel consumed—Coal, 5,179 tons; total cost.....	\$8,354 25
Losses, etc., paid—On goods and baggage.....	37 27
For animals killed in Ohio :	
Horse, 1.....	\$75 00
Cattle, 4.....	77 00
Sheep, 1.....	10 00
Total .....	\$162 00

## TRANSPORTATION.

Passengers—Number carried, local .....	139,197
through .....	14,998
Total .....	154,195
Average number of miles traveled by each.....	23.99
Total mileage, or number carried one mile.....	3,700,343
Average amount received for each .....	57.6 cents.
Average amount per mile received for each .....	2.4 "
Freight—Tons carried, local .....	143,723.68
through.....	42,443.84
Total.....	186,167.52

## 1345

Average tons in each loaded car per mile.....	13.6
Total movement, or tons carried one mile ....	6,165,594
Average amount received for each ton.....	66.8 cents.
Average amount <i>per mile</i> received for each ton.....	2.02 "
Average cost per ton freight per mile.....	1.02 "
Average amount received for each ton through freight .....	95.9 "
Average amount received for each ton local freight .....	58.3 "

	Tons.	Per cent.
Coal.....	85,342.2	45.9
Stone, lime, sand, etc.....	5,815.3	03.1
Petroleum.....	908.2	00.5
Ores.....	268.1	00.2
Pig and bloom iron.....	1,297.3	00.7
Manufactured iron.....	3,372.5	01.7
Lumber and other forest products.....	19,942.7	10.7
Grain, flour, and other agricultural products.....	16,795.9	09.1
Live stock.....	697.7	00.4
Animal products.....	389.9	00.2
Manufactures, including agricultural implements.....	38,772.8	20.8
Merchandise.....	4,265.7	02.3
Miscellaneous.....	8,299.2	04.4
Total tonnage yielding revenue.....	186,167.5	100.
Supplies for company's use, including coal.....	6,179	

## EARNINGS.

Passenger transportation—local.....	\$69,510 92	
through .....	18,836 10	
	<hr/>	
Total .....		\$88,347 02
Freight transportation—local.....	\$83,776 69	
through .....	40,731 33	
	<hr/>	
Total .....		\$124,508 02
Mail service.....		3,179 66
Express service .....		3,050 83
Other sources ....		5,161 89
		<hr/>
Total earnings of line operated included in this report.....		\$224,247 42

## OPERATING EXPENSES.

Maintenance of way and structures.....	\$21,729 83
Maintenance of cars .....	8,371 72
Motive power .....	4,435 47
Conducting transportation .....	6,021 86
General expenses:	
Taxes in Ohio.....	2,667 80
Salaries .....	8,870 68
Other general expenses of operating.....	6,865 39
Total operating expenses, being 50.5 per cent. of earnings.....	\$113,362 75
Net earnings of 58.7 miles operated.	
Net income over operating expenses and rents paid.....	110,884 67
Per mile of earnings, \$3,820.22; proportion for Ohio (58.7 miles), all.	
operating expenses, \$1,931.22.	
net earnings, \$1,889.	

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock .....	\$4,578 34
Sale of bonds of company at \$100.....	45,100 00
Increase of floating debt .....	144,384 87
	<u>\$194,063 21</u>

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net) .....	\$110,016 61
Interest on floating debt .....	12,147 88
Construction of new work.....	182,783 39
	<u>\$304,947 88</u>

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock.....	\$761,036 27
Miscellaneous receipts.....	9,866 81
First mortgage bonds .....	1,600,000 00
Accrued interest on bonds .....	164,881 50
Accounts payable .....	97,717 85
Balance from income account .....	20,944 35
	<u>\$2,654,446 78</u>

## ASSETS.

Construction of road.....	\$2,611,708 14
Supplies .....	7,276 21
Cash.....	11,598 13
Accounts and bills receivable.....	21,196 50
Taxes .....	2,667 80
	<u>\$2,654,446 78</u>

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30

No. 1—September 1, unknown; gymnastic on passenger train—fatal; died next day.

No. 2—April 18, Hiram Haring, unknown; intoxicated, asleep on track—broken arm.

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Passengers—Struck by bridge, chute, or other obstruction.....	1
Total .....	1

## PERSONS INJURED—CAUSES.

Others—Lying, walking, falling, or being on track.....	1
Total .....	1

## RECAPITULATION.

Killed—Passengers—misconduct or want of caution.....	1
Total killed .....	1
Injured—Others—trespassing, on track, etc.....	1
Total injured.....	1

*State of Ohio, County of Cuyahoga, ss.:*

J. H. Wade, President of the Valley Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

J. H. WADE,

*President.*

Subscribed and sworn to before me, this 19th day of September, A. D. 1881.

[SEAL.]

WM. B. PORTER,

*Notary Public.*

## WABASH, ST. LOUIS AND PACIFIC RAILWAY COMPANY.

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Name of road: Wabash, St. Louis and Pacific Railway.

By whom owned: Wabash, St. Louis and Pacific Railway Company.

By whom operated: Wabash, St. Louis and Pacific Railway Company.

By what authority: General Laws of Ohio.

Name of company making this report: Wabash, St. Louis and Pacific Railway Company.

General office at St. Louis, Missouri.

Principal office in Ohio at Toledo.

Address correspondence relating to this report to James F. How, Second Vice President, at St. Louis, Missouri.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Toledo and Wabash Railway, organized 1862.

Great Western Railway, organized 1859.

Toledo and Wabash Railway consolidated with the Great Western Railway in 1865, the consolidated company taking the name of the Toledo, Wabash and Western Railway.

Toledo, Wabash and Western Railway, placed in the hands of Jacob D. Cox, Receiver, in February, 1875.

Wabash Railway, organized January 6, 1877, and acquired property of Toledo, Wabash and Western Railway at foreclosure sale in February, 1877.

The St. Louis, Kansas City and Northern Railway was organized under the general laws of Missouri January 2, 1872, and purchased the property of the North Missouri Railroad from Morris K. Jessup, Trustee, February 6, 1872.

Wabash Railway was consolidated with St. Louis, Kansas City and Northern Railway November 10, 1879, the consolidated company taking the name of the Wabash, St. Louis and Pacific Railway Company.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Solon Humphreys.....	President.....	New York.....	
A. L. Hopkins .....	First Vice President.....	" .....	
James F. How .....	Sec'y & 2nd Vice President	St. Louis.....	
W. B. Cornean .....	Treasurer .....	" .....	
D. B. Howard.....	Auditor .....	" .....	
John C. Gault.....	General Manager.....	" .....	
A. C. Bird.....	Traffic Manager.....	" .....	
R. Andrews.....	General Superintendents..	Toledo.....	
T. McKissock.....		St. Louis.....	
E. A. Garvey.....	Chief Engineer .....	" .....	
H. C. Townsend.....	Gen'l Passenger Agent.....	" .....	
M. Knight.....	General Freight Agent.....	" .....	
Geo. H. Daniels.....	Gen'l Ticket Agent .....	" .....	
Solon Humphreys.....	Executive Committee. {		
A. L. Hopkins.....			
Jay Gould.....		New York.....	
Russell Sage.....			
Sidney Dillon.....			

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Solon Humphreys.....	New York.....	Geo. L. Dunlap.....	Chicago.
A. L. Hopkins.....	" .....	F. L. Ames.....	Boston.
Jay Gould.....	" .....	James Cheney.....	Fort Wayne.
Russell Sage.....	" .....	James F. Joy.....	Detroit.
Thomas E. Tutt.....	St. Louis.....	Samuel Sloan.....	New York.
James F. How.....	" .....	George G. Haven.....	" .....
Benj. W. Lewis.....	" .....	Sidney Dillon.....	" .....
Charles Ridgely.....	Springfield, Ill..		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$22,064,800 00	
preferred .....	21,587,000 00	
		\$43,651,800 00
Number of shares—common.....	220,648	
preferred.....	215,870	
		436,518
Par value of each—common .....		\$100 00
preferred.....		100 00
Increase since June 30, 1880—common.....	\$2,064,800 00	
preferred.....	1,587,000 00	
		3,651,800 00



## FUNDED DEBT.

First mortgage bonds, Toledo and Illinois Railroad .....	\$900,000 00
"        "        Lake Erie, Wabash and St. Louis Railroad .....	2,500,000 00
"        "        Great Western Railroad of 1859.....	2,496,000 00
"        "        Illinois and Southern Iowa Railroad .....	300,000 00
"        "        Decatur and East St. Louis Railroad .....	2,700,000 00
"        "        Quincy and Toledo Railroad.....	500,000 00
"        "        Great Western Railroad, west of Decatur.....	3,000 00
Second mortgage bonds, Toledo and Wabash Railroad.....	1,000,000 00
"        "        Wabash and Western Railroad .....	1,500,000 00
"        "        Great Western Railroad, of 1859.....	2,500,000 00
Consolidated sinking fund bonds, Toledo, Wabash and Western R. R....	2,610,000 00
Wabash Railway, funded debt bonds, 7 per cent .....	524,500 00
"        "        "        "        graduated .....	1,243,500 00
"        "        second consolidated mortgage bonds.....	1,600,000 00
Mortgage notes, second series .....	49,000 00
Mortgage notes, third series.....	360,000 00
Graduated scrip certificates .....	639,560 50
7 % scrip certificates, from August 1, 1877 .....	116,585 00
7 % "        from February 1, 1877 .....	416,212 77
Rolling stock certificates .....	50,000 00
First mortgage bonds, Hannibal and Naples Railroad.....	500,000 00
"        "        Champaign, Havana and Western Division.....	1,572,000 00
"        "        Chicago Division.....	4,500,000 00
Real estate notes .....	73,000 00
General mortgage bonds .....	7,750,000 00
First mortgage bonds, North Missouri Railroad.....	6,000,000 00
Real estate and Railway mortgage bonds, St. L., K. C. and N. R. R.....	3,000,000 00
St. Charles Bridge, 1st mortgage bonds.....	1,000,000 00
St. Charles Bridge, 2d mortgage bonds.....	388,500 00
First mortgage bonds, Omaha Division.....	2,350,000 00
First mortgage bonds, Clarinda Branch.....	264,000 00
Total.....	\$49,405,858 27
Average amount per mile of single main track (2,558.88 miles) .....	\$19,306 70
Proportion of same for Ohio (75 miles).....	1,448,002 50
Increase since June 30, 1880.....	13,875,152 25

## OTHER INDEBTEDNESS.

Total unfunded debt.....	\$2,765,700 55
Cash securities, debit balances, etc., available to payment .....	444,802 48
Net unfunded debt.....	\$2,310,898 07
Average amount per mile of single main track.....	\$903 05
Proportion of same for Ohio.....	67,728 75
Decrease since June 30, 1880.....	1,196,144 68
Total net debt liabilities.....	50,602,002 95

Average amount per mile of single main track.....	\$20,209 75	
Proportion of same for Ohio.....	1,515,731 25	
Total of paid in stock and debt.....		94,252,802 95
Total average amount per mile .....	\$36,832 28	
Proportion of same for Ohio .....	2,762,421 00	

## COST OF ROAD EQUIPMENT, APPURTENANCES, Etc.

Total expenditures for construction and equipment prior to July 1, 1880, \$88,182,086 46 ;  
Expenditures for the year ending June 30, 1881, \$5,736,990.19 ; total expenditures  
to July 1, 1881, \$93,919,076.65.

## EQUIPMENT OWNED BY COMPANY.

Number—

458 locomotives, 163 first-class passenger cars, 2 dining passenger cars, 12,581 box freight and platform cars, 116 baggage, mail and express cars, 8 parlor cars, 779 caboose and all other cars.

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

	Length. Miles.	In Ohio. Miles.
Single main track, Toledo to Mississippi and Missouri river points	2,558.88	75
Total single main track.....	2,558.88	75
Aggregate of sidings and other tracks .....	349.80	41.80
Total length laid with rail computed as single track .....	2,907.80	116.80
Laid with steel rail .....	969	75
Length in Ohio, distributed as follows :		

County.	Main track.	Sidings, etc.	Total.
	Miles.	Miles.	
Lucas .....	21.	25.58	46.58
Fulton.....	.32		.32
Henry.....	20.23	4.64	24.87
Defiance ..	14.24	7.47	21.71
Paulding .....	19.21	4.11	23.32
Total .....	75.	41.80	116.80

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 ft. 8½ in.
Grade—Maximum per mile.....	35 feet.
Longest maximum.....	2 miles.
Aggregate length of maximum .....	2 "

Curvature—Aggregate length of shortest radius.....	900 feet
Aggregate length of all radii.....	18,534 "
Aggregate length of tangent.....	71.49 miles.
Rail—Iron—On road.....	75 "
Average weight per yard.....	56 lbs.
Ties—Average number per mile.....	3,000
Number laid during the year.....	28,000
Ballasted—On whole line—In Ohio, Ind., and Ill .....	267 miles.
In Ohio .....	75 "
With sand, gravel and rock.	

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Wood, 1; greatest age, 1 year; aggregate length, 112 feet.	
Iron, 1; greatest age, 10 years; aggregate length 677 feet.	
Combination, 2; greatest age, 9 years; aggregate length, 288 feet.	
Stone arch, 1; greatest age, 13 years; aggregate length, 65 feet. Total, 1,082.	
Trestles—7; greatest age, 2 years; greatest height, 31 feet; greatest length, 408 feet; aggregate length, 1,559 feet.	
Length of shortest span of truss, 68 feet; of longest, 157½ feet; greatest length of beams between points of support, if not trussed, 13 feet.	
Greatest space between cross ties upon bridges and trestles, 10 inches length of ties, 14 feet.	
Number of track-stringers, 4.	
Are all bridges and trestles provided with guard rails? Yes.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Every 30 days.	
Are the examinations analytical, and are they made by a competent person? Yes.	

## FENCING—AVERAGE AND AGGREGATE COST.

	Whole line.	In Ohio.
Number miles fencing, computed as single line.....		110
Kind of fencing, as follows:		
Post and board (average cost per rod, \$1.10).		
Rail (average cost per rod, 90 cents).		
Wire (average cost per rod, 87 cents).		
Average cost of same per rod.....	\$1.10	\$1.10
Length of road unfenced, and the reason therefor: In town		
and at points where fence is not needed.....		20 miles.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

L. S. & M. S. R. R. at Toledo.

B. & O. R. R. at Defiance Junction.

Number of crossings of highways at grade in this State without protection, 116.  
 Number of crossings of highways at grade in this State at which there are gates or  
 flagmen, one.  
 Number of crossings of highways over railroad, 2.  
 " " " under railroad, 1.  
 Number of highway bridges 18 feet above track, 2.  
 Do all trains stop at railroad crossings as required by law? Yes.  
 Are flagmen stationed at each? Yes.

## STATIONS AND TELEGRAPH.

## STATIONS.

Passenger and freight, in Ohio .....	13
Number with telegraph communication, in Ohio .....	11

## ROLLING STOCK.

Sleeping cars, 16; owned by Pullman Car Co.  
 Locomotives, 458; owned by Wabash, St. L. & P. Railway.  
 Express and baggage cars, 116.  
 Passenger cars, 163.  
 Parlor cars, 8.  
 Freight cars, 12,581.  
 Other cars, 779.  
 Terms of service, from 1 to 20 years.  
 Kind of brake: Westinghouse.  
 Number of cars equipped with train brakes, 163.  
 Kind: Westinghouse Automatic.  
 Number of passenger cars with "Miller Platform" and Blackstone platforms, 163.  
 Are all cars run on this road heated and lighted as prescribed by law? Yes.

## EMPLOYES.

General officers and clerks .....	240
Superintendents and clerks .....	112
Engineers, firemen and wipers .....	1,245
Machinists and helpers .....	972
Master mechanics and clerks .....	48
Conductors, baggagemen and brakemen .....	979
Station agents, clerks and laborers .....	2,071
Section men .....	3,484
Other employes .....	1,188

Total number employed by company in operating line..... 11,211

## EXPRESS AND TRANSPORTATION COMPANIES.

Express companies run on this road: Pacific and United States.  
 Special freight and transportation lines: Red Line, Merchants' Dispatch, Erie and  
 North Shore Dispatch, Wabash and Erie Line, National Dispatch, Hoosac Tunnel  
 Line, Canada Southern Line, South Shore Line, and Star Union Line.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Trestles built in Ohio—2; aggregate length, 331 feet.

Fencing in Ohio—Miles of single fence built (average cost per rod, \$1.10), 21.

Ballasting—Miles of main track, ballasted with stone and gravel, in Ohio, 25.

Rail laid—Steel, 59 lbs. per yard—miles of track in Ohio, 9.

## TRANSPORTATION.

Passengers—Number carried .....	1,497,329
Average number of miles traveled by each .....	48.4
Total mileage, or number carried one mile .....	114,487,013
Average amount received for each .....	\$1.07
Average amount <i>per mile</i> received for each .....	2.279 cts.
Freight—Tons carried .....	4,888,769
Total movement, or tons carried one mile .....	1,118,231,413
Average amount received for each ton .....	206 cts.
Average amount <i>per mile</i> received for each ton .....	.894 cts.

## Articles transported :

	Tons.	Per cent.
Coal .....	540,055	11.2
Stone, lime, sand, etc. ....	87,498	1.8
Petroleum .....	26,224	.6
Ores .....	26,482	.6
Pig and bloom iron .....	29,457	.7
Manufactured iron .....	182,080	3.8
Lumber and other forest products .....	587,943	12.9
Grain, flour, and other agricultural products .....	2,058,396	42.4
Live stock .....	363,372	5.1
Animal products .....	62,587	1.3
Manufactures, including agricultural implements .....	124,695	2.5
Merchandise .....	673,622	14.5
Miscellaneous .....	126,358	2.6
Total tonnage yielding revenue .....	4,888,769	100

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30TH.

## EARNINGS.

Passenger transportation—Total .....	\$2,506,037 71
Freight transportation—Total .....	10,184,556 99
Mail service .....	264,306 95
Express service .....	341,968 67
Other sources .....	144,234 46

Total earnings of line operated included in this report ..... \$13,441,104 78

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$1,533,650	54
Renewals .....	987,061	27
Motive power and cars .....	3,411,226	60
Conducting transportation .....	2,684,920	11
General expenses .....	496,331	58
Taxes in Ohio—		
Lucas county .....	\$10,720	87
Fulton “ .....	80	73
Henry “ .....	6,889	52
Defiance “ .....	4,374	22
Paulding “ .....	7,656	17
Total taxes .....	\$29,721	51
<hr/>		
Total operating expenses .....	9,113,190	10
Rentals paid (for use of road, track, depots, equipment), etc., and miscellaneous items .....	444,240	30
Taxes .....	306,300	00
Net income over operating expenses and rents paid .....	554,979	61
Percentage of same to capital stock and debt .....	.592	

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Sale of bonds of company (\$7,717,000) .....	\$7,275,824	79
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## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$43,651,800	00
Funded debt .....	49,405,858	27
Bills payable, vouchers and accounts.....	2,765,700	55
Income account since January 1, 1881.....	554,979	61
	<hr/>	\$96,378,338 43

## ASSETS.

Road equipment and appurtenances—cost.....	\$87,406,823	95
Sundry securities.....	444,802	48
Supplies on hand.....	2,014,459	30
Expenditures for construction and equipment since January 1, 1880.....	6,512,252	70
	<hr/>	\$96,378,338 43

## ACCIDENTS IN OHIO TO PERSONS DURING THE YEAR ENDING JUNE 30, 1881.

No.	Date.	Name of person.	Occupation.	Cause of accident.		Character of injury.
1	1880.					
2	July 10	Carrie A. French ..	.....	Collision at Toledo .....	.....	Killed.
3	Aug. 28	Jas. Norton .....	Switchman .....	Fell under cars while switching .....	.....	"
4	Sept. 26	F. Gadde .....	Car repairer .....	Struck by train while walking on track at Toledo .....	.....	"
5	1881.					
6	Feb. 19	Mich. Izorsky .....	.....	Attempted to get on moving train at Toledo .....	.....	"
7	Mar. 30	T. E. Jones .....	.....	Collision at Colton, O. ....	.....	Cut over both eyes and back hurt.
8	30	M. Wilder .....	.....	"	.....	Cut over left eye.
9	30	E. H. Raymond .....	.....	"	.....	Concussion of brain.
10	30	F. Dulkan .....	.....	"	.....	Right leg broken.
	30	Casher Younk .....	.....	"	.....	Cut on head and face.
	30	Jno. Rodgers .....	.....	"	.....	"

## SUMMARY OF ACCIDENTS.

## PERSONS KILLED—CAUSES.

Others—Getting on or off engine or train in motion.....	1
Passengers—Collisions, and standing on platform of car during same.....	1
Employes—Lying, walking, falling, or being on track.....	1
Run over in yards, on siding or in switching.....	1
Total.....	4

## PERSONS INJURED—CAUSES.

Employes—Collisions .....	6
Total .....	6

## RECAPITULATION.

Killed—Passengers—from causes beyond their control.....	1
Employes - from causes beyond their control .....	1
misconduct or want of caution .....	1
Others—stealing rides .....	1
Total killed .....	4
Injured—Employes—from causes beyond their control.....	6
Total injured .....	6

*State of Missouri, City of St. Louis, ss. :*

James F. How, Second Vice President and officer in charge at St. Louis, Mo., of the Wabash, St. Louis & Pacific Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

JAMES F. HOW,

*Sec'd Vice Pres't and officer in charge at St. Louis, Mo., of W., St. L. & P. R. R.*

[SEAL OF R. R.]

Subscribed and sworn to before me, this 15th day of September, A. D. 1881.

GEO. S. GROVER,

[SEAL.]

*Notary Public, City of St. Louis, State of Missouri.*





RAILWAY LINES IN PROGRESS.

## CHICAGO AND ATLANTIC RAILWAY COMPANY.

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Location of principal office of the company at Huntington, Indiana.

Principal office in Ohio at Kenton, Ohio.

Address correspondence relating to this report to L. P. Milligan, Secretary, at Huntington, Indiana.

### CORPORATE HISTORY.

This company was organized under articles dated July 15, and filed August 6, 1873, with the Secretary of State of Ohio, by a consolidation of the Chicago and Atlantic Railway Company, of Indiana and Illinois (which was the result of the previous consolidation of the Chicago and Atlantic Railway Company of Indiana, with the Chicago and Atlantic Extension Railway Company of Illinois), and the Baltimore, Pittsburgh and Continental Railway Company of Ohio.

This latter named company organized by filing certificate of incorporation with Secretary of State March 10, 1870, to build a road from a point in Middletown township, Columbiana county, Ohio, on the boundary line between Ohio and Pennsylvania, westerly, through the State of Ohio to a point on the boundary line between the State of Ohio and Indiana, at or near the northwest corner of Washington township, Mercer county. The proposed line of the Chicago and Atlantic Railway Company is from Chicago via Kenton and Marion, Ohio, to the northeast corner of Unity township, Columbiana county, which is the point on the State line where that county adjoins Mahoning county, 432 miles. August 23, 1873, a contract was made with the Western Railway Construction Company, by which it was to obtain the right-of-way, construct and equip the road from Marion, Ohio, to Chicago for \$7,000,000, first mortgage bonds and \$5,250,000 capital stock of the Chicago and Atlantic Railway Company, together with all subsidies obtained along the line, to be delivered in pro rata amounts as each consecutive ten miles is completed. This construction company became insolvent, and an attempt was made to transfer its contract to the Central Construction Company of Illinois. This contract was abandoned January 4, 1880 (Record No. 20, p. 271). It was resolved to increase the capital stock of this company from \$7,000,000 to \$10,000,000. November, 1880 (Record No. 20, p. 332), the stock was so increased, and the Directors were authorized to issue coupon bonds, secured by mortgage on the property for \$6,500,000.

November 24, 1880, a contract (modified February 25, 1880,) was made with J. Edwin Conant and J. Condit Smith, of New York, for the construction of the road from Marion, Ohio, to Chicago, Illinois, said contractors agreeing to assume the liabilities of the company and accepting certain securities, the right-of-way granted, the grading and other work done, in payment for the construction and equipment.

This contract was again modified May 26, 1881, the contractors agreeing to lay a heavier rail to supply an equipment costing one million dollars instead of five hundred thousand dollars, as originally agreed, and materially to decrease the grade as first fixed. They were, in consideration of the foregoing, allowed to connect the company's road with the Chicago and Western Indiana Railroad Company's road at Hammond, a point on the State line of Illinois and Indiana, distant about 19 miles from Chicago, they having secured from the latter company the right to run into Chicago over their road, with ample terminal facilities in said city, for the period of nine hundred and ninety-nine years.

The mortgage of 1880 was canceled, and the bonds, secured by the same, destroyed. A new mortgage, covering the company's property, securing \$6,500,000 of bonds, was executed and recorded, and new bonds issued, all of which have been negotiated. The surveys are being pushed rapidly with a view to a speedy, permanent location of the line, and the contractors are preparing to commence work on the entire line. It is expected the entire grading of the road will be completed during the present year, and that the road will be in running order early in the fall of 1882.

The length of the road from Marion to Hammond is about 249 miles; from Hammond to Chicago about 19 miles, making the entire distance from Marion to Chicago 268 miles. The nine miles of road (narrow gauge) from Markle to Huntington, which, in last year's report, is spoken of as being in operation, has been abandoned, and the rails taken up and removed. On the 5th of November, 1880, a new Board of Directors was elected and new officers chosen.

They are as follows:

#### DIRECTORS.

Samuel B. Smith.....	New York.
O. W. Child.....	"
E. E. Willis.....	"
S. M. Terry.....	Rochester, Ind.
J. W. Purviance.....	Huntington, Ind.
Geo. J. Bippus.....	"

L. T. Hunt .....	Kentno, Ohio.
Thomas Espy.....	"
President, Samuel B. Smith .....	New York.
Treasurer, Edwin E. Willis.....	"
Secretary, L. P. Pellilligan.....	Huntington, Ind.

SAM. B. SMITH, *President.*

June 30, A. D. 1881.

*State of Indiana, County of Huntington, ss. :*

Samuel B. Smith, President of the Chicago and Atlantic Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

SAM. B. SMITH,

*President Chicago & Atlantic R'y Co.*

Subscribed and sworn to before me, a Notary Public, this 28th day of September, A.D. 1881.

[SEAL.]

ORLANDO W. WHITELOCK,

*Notary Public.*

# CINCINNATI, HOCKING VALLEY AND HUNTINGTON RAIL- WAY COMPANY.

Name of road: Cincinnati, Hocking Valley and Huntington Railway.

By whom owned: The stockholders.

By whom operated: Not yet in operation.

By what authority: Charter.

Name of company making this report: Cincinnati, Hocking Valley and Huntington Railway Company.

General office at Fayetteville, Ohio.

Principal office in Ohio at Fayetteville, Ohio.

Address correspondence relating to this report to T. S. Murray, Secretary, at Fayetteville, Brown county, O.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

October 14, 1880.—The Board let to Henry T. Niles & Co. the contract to grade, bridge, tie, iron and equip the road from its junction with the Cincinnati and Eastern Railway to Nelsonville.

Since this contract was made, Niles & Co. have done considerable work on the road, consisting of engineering, taking right of way, grading, erecting trestles, etc., and have laid about two miles of iron.

These expenditures are not embraced in this report, no estimates having been made or given the contractors at this date.

By decree of the Brown county Common Pleas Court, January term, 1881, the name of the company was changed from "The Cincinnati, Fayetteville, Hillsboro and Huntington Railway Company" to "The Cincinnati, Hocking Valley and Huntington Railway Company".

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Wm. Rondebush.....	President .....	Newtonville, O.....	No agr'm't as to.
Silas J. Bivans.....	Vice President .....	Fayetteville, O .....	" " " " " "
T. S. Murray.....	Secretary .....	" .....	\$50 per month.
S. Shriner.....	Treasurer .....	Newtonville, O.....	No agr'm't as to.
Maj. W. L. Brigdon..	Chief Engineer .....	Fayetteville, O.....	No sp'c'l agr'mt.

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Wm. Rondebush.....	Newtonville, O.	Jas. Clark.....	Belfast, O.....
S. J. Bivans.....	Fayetteville, O.	S. J. Rybolt .....	Mulberry, O.....
Jas. Connally.....	"	D. K. Harvey .....	Milford, O.....
M. Gallaher.....	"	Geo. A. Rusk.....	"
Luke Higgins.....	Logtown, O.....		

## CAPITAL STOCK.

Capital stock authorized by law—Amount— common.....	\$5,250,000 00
Number of shares—common.....	105,000
Par value of each—common.....	\$50 00
Capital stock—Amount subscribed—common .....	806,000 00
Total paid in capital stock—common .....	31,298 98
Average amount paid in per mile of single main track (2.2 miles*).....	1,422 68
Stockholders residents of Ohio, 475.	

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate...	\$9,632 24	
Cash securities, debit balances, etc, available to paym't .....	856 32	
Net unfunded debt.....		\$8,775 92
Increase since June, 30, 1880.....	\$1,038 39	
Proportion of same for Ohio.....	All.	
Total of paid in stock and debt.....		40,931 22
Total average amount per mile from C. & E. Junction to Fayetteville.....	\$1,860 57	
Proportion of same for Ohio.....	All.	

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1, 1881.
Right of way.....	\$1,078 50		\$1,078 50
Civil engineering.....	2,118 76	\$14 00	2,132 76
Grading and masonry .....	20,373 06	350 70	20,723 76
Bridges .....	4,576 00		4,576 00
Timber and ties .....	6,986 17	1,282 53	8,268 70
Interest and discount.....	467 05		467 05
Contingent expenses .....	1,986 67	927 70	2,914 37
Total expenditures for construction .....			\$40,161 14

\*From Cincinnati and Eastern Railway Junction to Fayetteville—no work having been done east of Fayetteville, Ohio.

## CHARACTERISTICS, ETC.

## PROPOSED LINES.

From Cincinnati, Ohio, via Fayetteville to Nelsonville, Ohio, 150 miles.

Length graded, not laid with rail, 18 miles.

What portion of the line: From C. and E. Junction to near Fayetteville, Ohio.

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Payments on capital stock, including stock paid on contract	\$31,298 98	
Bills payable.....	7,310 08	
Individual accounts .....	2,322 16	
Interest .....	86 24	
		<hr/> \$41,017 46

## ASSETS.

Rights of way .....	\$1,078 50	
Civil engineering .....	2,132 76	
Grading and masonry.....	20,723 76	
Bridging .....	4,576 00	
Timber and ties .....	8,268 70	
Interest and discount.....	467 05	
Contingent expenses .....	2,914 37	
Debit balances available to payment .....	856 32	
		<hr/> \$41,017 46

*State of Ohio, County of Brown, ss.:*

Silas J. Bivans, Vice President of the Cincinnati, Hocking Valley and Huntington Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

SILAS J. BIVANS,

[SEAL OF R. R.]

*Vice President.*

Subscribed and sworn to before me, this 25th day of August, A. D. 1881.

MILTON FOX,

[SEAL.]

*Justice of the Peace.*



# COLUMBUS, JEFFERSONVILLE AND CINCINNATI RAILWAY COMPANY.

Name of road : The Columbus, Jeffersonville and Cincinnati Railway.

By whom owned : The Columbus, Jeffersonville and Cincinnati Railway Company.

By what authority : Charter and stock ownership.

Name of company making this report : Columbus, Jeffersonville and Cincinnati Railway Company.

General office at Mt. Sterling, Madison county, Ohio.

Principal office in Ohio at Mt. Sterling, Madison county, Ohio.

Address correspondence relating to this report to S. F. Rock, Secretary and Auditor, at Mt. Sterling, Ohio.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

The original charter was filed with the Secretary of State March 1, 1876, and the name assumed in said charter was "The Jeffersonville, Mt. Sterling and Columbus Railroad Company," the termini being Columbus, Franklin county, Ohio, and Jeffersonville, Fayette county, Ohio. On the 7th day of December, 1878, an amendment extending the western terminus from Jeffersonville to Cincinnati, Hamilton county, Ohio, was filed with the Secretary of State. On the 19th day of February, 1879, a decree of the Court of Common Pleas, Madison county, Ohio, January term 1879, changing the name of the road from the "Jeffersonville, Mt. Sterling and Columbus Railroad Company" to that of "The Columbus, Jeffersonville and Cincinnati Railway Company" was filed with the Secretary of State. Also, on the 10th day of April, 1880, the directors filed with the Secretary of State a certificate for the incorporation of a branch line from Mt. Sterling, Ohio, to Hillsboro, Ohio, passing into and through the counties of Madison, Fayette and Highland.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
George Kions .....	President .....	Mt. Sterling, O.....	.....
S. F. Rock.....	Secretary <i>pro tem</i> .....	" .....	.....
J. G. Loafbourron .....	Treasurer .....	" .....	.....
S. F. Rock.....	Auditor <i>pro tem</i> .....	" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
George Kions .....	Mt. Sterling, O..	Jesse Hegler .....	Wash'ton C.H., O
S. F. Rock .....	" ..	U. Hidy .....	Jeffersonville, O
S. McClintock .....	" ..	Cyrus Seeds, Jr.....	Shadeville, O.
Wm. McCafferty .....	" ..	J. M. Lane .....	Com'l Point, O.
Willis Hays .....	Jeffersonville, O		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$400,000 00
Number of shares—common .....	8,000
Par value of each—common .....	\$50 00
Amount subscribed—common .....	58,850 00
Total paid in capital stock—common.....	17,277 53

Capital stock issued, and on what account, as follows:

For subscriptions paid in cash—No. shares, 309; amount of common...	15,450 00
Stockholders, residents of Ohio, 282.	

Amount of stock held by them June 30, 1881, \$15,450.

Agents authorized to transfer stock: S. F. Rock, Mt. Sterling, Ohio.

Number of shares transferred within the year at such agencies, 4.

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$12,464 95	
Total unfunded debt.....	12,464 95	
Cash securities, debit balances, etc., available to payment		
—unpaid subscription with interest.....	44,316 81	
Net unfunded debt .....		\$56,781 76
Total net debt liabilities.....	\$12,464 95	

## COST OF ROAD EQUIPMENT, ETC.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expendi- tures to July 1, 1881.
Right of way.....	\$3,300 75		\$3,300 75
Civil engineering.....	2,628 75		2,628 75
Grading and masonry .....	6,487 09		6,487 09
Bridges .....	2,289 87		2,289 87
Timber and ties .....	8,337 77		8,337 77
Interest and discount.....	600 00	\$700 00	1,300 00
Contingent expenses.....	4,332 79		4,332 79
Total expenditures for construction...	\$27,977 02	\$700 00	\$28,677 02

## CHARACTERISTICS, ETC.

## PROPOSED LINES.

From Columbus via Jeffersonville to Cincinnati, 112 miles.

From Mt. Sterling via Washington C. H. to Hillsboro, 42 miles.

Length graded, not laid with rail, 16½ miles.

State on what portion of the line: Between Mt. Sterling and Allentown.

Proposed gauge, 36 inches.

Line in operation: None.

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock.....	\$250 00	
Increase of floating debt.....	700 00	
		<hr/> \$950 00

## \* PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Floating debt liquidated.....	\$250 00
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## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Capital stock .....	\$58,850 00	
Due to individuals.....	12,464 95	
		<hr/> \$71,314 95

## ASSETS.

Construction .....	\$28,677 02	
Personal property .....	186 84	
Due on subscription to capital stock.....	41,572 47	
Interest .....	878 62	
		<hr/> \$71,314 95

*State of Ohio, County of Madison, ss.:*

George Kions, President of the Columbus, Jeffersonville & Cincinnati Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

GEO. KIONS,

*President.*

Subscribed and sworn to before me, this 11th day of October, A. D. 1881.

C. H. HANNAWALT,

[SEAL.]

*Notary Public.*

# CONNOTTON VALLEY AND STRAITSVILLE RAILROAD COMPANY.

Name of road : The Connotton Valley & Straitsville Railroad.

By whom owned : The Connotton Valley & Straitsville Railroad Company.

By whom operated : Not yet constructed.

Name of company making this report : The Connotton Valley & Straitsville Railroad Company.

General office at Canton, O.

Principal office in Ohio at Canton, O.

Address correspondence relating to this report to A. B. Proal, Secretary and Treasurer, at Canton, O.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

This company was incorporated under the general laws of the State in 1874, for the construction of a road from Coshocton to Massillon, called the Massillon and Coshocton Railroad Company; subsequently, its name was changed to the Cleveland, Canton, Coshocton and Straitsville Railway Company, and its route was changed so as to pass through Canton, and Cleveland was made its northern terminus.

In June, 1881, its southern terminus was changed to Athens, and the name changed to its present name.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Wm. J. Rotch .....	President.....	New Bedford, Mass..	.....
R. B. Dennis.....	Vice-President.....	Cleveland, Ohio.....	.....
A. B. Proal.....	Secretary and Treasurer...	Canton, Ohio .....	.....
Wm. J. Ellis.....	Chief Engineer.....	" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Wm. J. Rotch.....	N. Bedford, Mass.	Wm. A. Lynch.....	Canton, Ohio.
Jos. B. Thomas.....	Boston, Mass.....	E. T. Sprangler .....	Coshocton, Ohio.
Cyrus Mansfield .....	" .....	J. C. Fisher.....	" .....
R. B. Dennis .....	Cleveland, O.....		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common .....	\$800,000 00
Number of shares—common .....	16,000
Par value of each—common .....	\$50 00
Increase since June 30, 1880—common .....	1,200,000 00
Capital stock—Amount subscribed—common .....	519,056 85
Total paid in capital stock—common .....	472,980 57
Average amount paid in per mile of single main track: No track laid.	

## CAPITAL STOCK ISSUED, AND ON WHAT ACCOUNT, AS FOLLOWS:

For services rendered, amount of common, \$25,000; for original construction, amount of common, \$400,000; total, \$425,000.

Agents authorized to transfer stock: Secretary at Company's office, Canton, Ohio.

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mortgage..	Mortgage.....	June 22, 1881	May 1, 1911	7	\$2,720,000	\$1,200,000

Average amount per mile of single main track: No track yet laid.

## COST OF ROAD EQUIPMENT, Etc.

Construction account.	Expenditures prior to July 1, 1880.	Expenditures for the year ending June 30, 1881.	Total expenditures to July 1, 1881.
Right of way.....	\$465,103 13	\$50,254 82	\$515,357 95
Civil engineering.....			
Grading and masonry .....			
Bridges .....			
Timber and ties .....			
Superstructure .....	3,576 73	7,458 01	11,034 74
Iron rails, chairs and spikes.....			
Interest and discount .....			
Total expenditures for construction.....			\$526,392 69

*State of Massachusetts, County of Suffolk, ss. :*

Francis Barlten, President of the Connotton Valley & Straitsville Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

FRANCIS BARLTEN.

[SEAL OF R. R.]

Subscribed and sworn to before me, this 15th day of October, A. D. 1881.

[SEAL]

JAS. B. BELL,

*Com'r for the State of Ohio, resident in Boston.*

# MARTIN'S FERRY AND BELLAIRE RAILWAY COMPANY.

Name of road: Martin's Ferry and Bellaire Railway.

By whom owned: Martin's Ferry and Bellaire Railway Company.

By what authority: Stock ownership.

Name of company making this report: Martin's Ferry and Bellaire Railway Company.

General office at Martin's Ferry, Ohio.

Principal office in Ohio at Martin's Ferry, Ohio.

Address correspondence relating to this report to W. H. Wood, Martin's Ferry, O.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

Charter dated May 30, 1873.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Joel Wood.....	President .....	Martin's Ferry, O.....	.....
Wm. H. Wood .....	Secretary.....	" .....	.....
C. H. Jenkins .....	Treasurer .....	Sandusky, O.....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Joel Wood .....	Martin's Ferry..	Joseph Bell.....	Wheeling, W. V.
James Kerr .....	"	R. H. Cochran.....	"
L. Spence .....	"	C. H. Jenkins .....	Sandusky, O.
W. H. Wood .....	"		

### CAPITAL STOCK.

Capital stock authorized by law—Amount, common .....	\$50,000 00
Par value of each, common.....	50 00
Capital stock—Amount subscribed, common .....	36,000 00
Total paid in capital stock, common .....	52 00
Average amount paid in per mile of single main track (6.90 miles)..	\$7 50
Stockholders residents of Ohio, 5.	
Amount of stock held by them June 30, 1881, \$26,000.00.	

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

Civil engineering, \$30.50; contingent expenses, \$10.00; total expenditures for construction prior to July 1, 1880, \$40.50.

## CHARACTERISTICS, Etc.

## PROPOSED LINES.

From Martin's Ferry via Bridgeport to Bellaire, 6.93 miles.  
Proposed gauge, 36 inches.

## CONDENSED GENERAL BALANCE SHEET, JULY 1st, 1881.

## LIABILITIES.

Capital stock .....	\$52 00
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## ASSETS.

Civil engineering account.....	\$30 50
Contingent expenses.....	10 00
Cash in hand.....	11 50
	<hr/>
	52 00

*State of Ohio, County of Belmont, ss.:*

Joel Wood, President of the Martin's Ferry and Bellaire Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

JOEL WOOD,

[SEAL OF R. R.]

*President.*

Subscribed and sworn to before me, this 30th day of August, A.D. 1881.

S. J. C. DRENNEN,

[SEAL]

*Notary Public.*



## MICHIGAN AND OHIO RAILWAY COMPANY.

Name of road: Michigan and Ohio Railway.

By whom owned: Michigan and Ohio Railway Company.

By what authority: The laws of Michigan and Ohio.

Name of company making this report: Michigan and Ohio Railway Company.

General office at Grand Haven, Michigan.

Principal office in Ohio at Columbus.

Address correspondence relating to this report to Jas. S. Gibbs, at Buffalo, N. Y.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
James S. Gibbs.. .....	President.....	Buffalo, N. Y.....	.....
F. W. Buthrick.. .....	Secretary .....	Battle Creek, Mich.....	.....
John Burt.....	Treasurer .....	Detroit, Michigan .....	.....
James S. Gibbs.....	} Executive Committee.. {	Buffalo .....	.....
John Burt.....		Detroit .....	.....
F. W. Buthrick.....		Battle Creek, Mich.....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
James S. Gibbs.. .....	Buffalo, N. Y.....	F. W. Buthrick .....	Battle C'k, Mich.
Henry Merrill.....	Toledo, O.....	C. S. Storrs .....	Gr'd Haven, "
John Burt .. .....	Detroit, Mich...	Edward P. Izong.....	" "
Peter I. Ralph.....	"		

### CAPITAL STOCK.

Capital stock authorized by law—Amount—common.....	\$15,000,000 00
Capital stock authorized by vote of company—common .....	15,000,000 00
Total paid in capital stock—common. ....	14,900 00
Average amount paid in per mile of single main track (400 miles).....	37 25
Proportion of same for Ohio (260 miles).....	9,685 00
Stockholders residents of Ohio, subscribers, 7.	

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
20 years .....	By mortgage on whole pr'p'ty	July 1, 1874	July 1, 1894	7%	\$15,000,000	\$200,000

## OTHER INDEBTEDNESS.

Total unfunded debt..... \$39,996 30

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

## Expenditures prior to July 1, 1880—

Right of way .....	\$250 60
Civil engineering .....	5,789 76
Interest and discount.....	62 50
Contingent expenses.....	33,508 11
Total expenditures for construction.....	\$39,508 11

*State of New York, County of Erie, ss.:*

James S. Gibbs, President of the Michigan and Ohio Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said Company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

JAMES S. GIBBS.

[SEAL OF R. R.]

Subscribed and sworn to before me this 7th day of July, A. D. 1881.

[SEAL.]

W. M. HAWKINS, *Notary Public.*

# STEUBENVILLE, CANTON AND CLEVELAND RAILWAY COMPANY.

Name of road: Steubenville, Canton and Cleveland Railway.

By whom owned: Steubenville, Canton and Cleveland Railway Company.

By whom operated: Not yet in operation.

By what authority: Being constructed under charter.

Name of person making this report: L. Fryer, Secretary Steubenville, Canton and Cleveland Railway Company.

General office at Richmond, Jefferson county, Ohio.

Principal office in Ohio at Richmond, Jefferson county, Ohio.

Address correspondence relating to this report to L. Fryer, Secretary, at Richmond, Ohio.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

Organized under charter, dated December 6, A. D. 1877; recorded vol. 17, page 145, "Record of incorporations for State of Ohio", under style of "Island Creek and Richmond Mineral Railroad Company". Charter amended March 15, A. D. 1881, to extend the line from Richmond, Jefferson county, Ohio, to Canton, Stark county, Ohio, through the counties of Jefferson, Carroll and Stark, and increased the capital stock to three hundred and sixty thousand (\$360,000) dollars.

Name of company changed to Steubenville, Canton and Cleveland Railway, February 4, A. D. 1881.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
J. C. M. Floyd.....	President.....	Richmond, O .....	.....
Benj. Shelly.....	Vice President.....	" .....	.....
L. Fryer .....	Secretary.....	" .....	.....
David Shelly .....	Treasurer.....	Knoxville, O.....	.....
Jas. S. Negley .....	General Manager.....	Pittsburgh, Pa.....	.....
David Shelly.....	} Executive Committee {	Knoxville, O.....	.....
Benj. Shelly.....		Richmond, O.....	.....
J. W. Stephenson.....		" .....	.....
L. Fryer .....		" .....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
J. C. M. Floyd.....	Richmond.....	D. Davidson.....	Island Creek.....
Benj. Shelly.....	".....	A. J. Ault.....	Jeddo, O.....
J. W. Stephenson.....	".....	D. Shelly.....	Knoxville, O.....
F. J. Frederick.....	".....	L. Freyer.....	Richmond.....

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY LAW.

Amount—common.....	\$60,000 00
Number of shares—common.....	124
Par value of each—common.....	\$50 00
Capital stock authorized by vote of company—common..... \$300,000	360,000 00
Amount subscribed—common.....	30,050 00
Total paid in capital stock—common.....	8,959 84
Average amount paid in per mile of single main track (72 miles).....	124 44
Proportion of same for Ohio (72 miles).....	All.

Stockholders, residents of Ohio, 124.

Amount of stock held by them June 30, 1881, \$8,959.84.

Agents authorized to transfer stock: J. C. M. Floyd, President, L. Fryer, Secretary,  
Richmond, Jefferson county, Ohio.

Number of shares transferred within the year at such agencies: None.

## COST OF ROAD EQUIPMENT, Etc.

Construction account	Total expenditures to July 1, 1881.
Right of way.....	\$3,730 57
Civil engineering.....	557 28
Grading and masonry.....	30,424 41
Bridges.....	100 00
Timber and ties.....	1,982 23
Fencing.....	154 87
Interest and discount.....	1,540 57
Contingent expenses.....	1,631 19
Total expenditures for construction.....	\$40,121 72

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881

## LIABILITIES.

Paid in stock.....	\$8,959 84	
Unfunded debt.....	31,161 88	
	<hr/>	\$40,121 72

## ASSETS.

Construction and grading.....	\$30,424 41	
Tie account.....	1,820 00	
Bridging account.....	100 00	
Fencing account .....	154 87	
Lumber account .....	162 23	
Engineering .....	557 28	
Rights of way .....	3,730 57	
Contingencies .....	1,631 79	
Interest and discount.....	1,540 57	
	<hr/>	\$40,121 72

*State of Ohio, County of Jefferson, ss. :*

L. Fryer, Secretary of the Steubenville, Canton and Cleveland Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

L. FRYER,

*Secretary.*

Subscribed and sworn to before me, this 29th day of July, A. D. 1881.

[SEAL]

J. W. STEPHENSON,

*Notary Public.*

## WHEELING AND LAKE ERIE RAILROAD COMPANY.

Name of road: The Wheeling and Lake Erie Railroad.

By whom owned: The Wheeling and Lake Erie Railroad Company.

By whom operated: Not operated, being only in process of construction.

Name of person making this report: W. A. Mack, President of The Wheeling and Lake Erie Railroad Company.

General office at Norwalk.

Principal office in Ohio at Norwalk.

Address correspondence relating to this report to W. A. Mack, at Norwalk.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Original charter was dated April 1, 1871, under the name of the Wheeling and Lake Erie Railroad Company. Supplemental certificate, dated December 22, 1873, giving authority to pass through the county of Lorain. Charter for construction of the Huron branch, running from "a point on the main line at or near Milan, Erie county, Ohio, to the government pier at Huron, in the same county", dated December 16, 1878, a distance of about 9 miles.

The road is now only in process of construction, no trains other than construction trains being operated, and is wholly in the hands of the contractor and lessee, and to so remain until the completion of the whole road from Wheeling to Toledo.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary
W. A. Mack.....	President .....	Norwalk .....	
C. H. Jenkins.....	Secretary .....	Sandusky .....	
D. A. Baker.....	Treasurer.....	Norwalk .....	
J. S. Oliver.....	General Manager.....	" .....	
J. S. Oliver.....	General Superintendent....	" .....	
John A. Hanlon.....	Chief Engineer.....	Massillon.....	
W. A. Mack.....	} Executive Committee.. }	Norwalk, O.....	
M. H. Pebbles.....		" .....	
J. N. Bostwick.....		" .....	
J. W. Wickham, Jr.....		" .....	
Joel Wood .....		Huron, O.....	
S. W. Sutherland.....		Martin's Ferry, O.....	
R. H. Cochran .....		Smithfield .....	
		Wheeling, W. Va.....	

## DIRECTORS.

Name.	Residence.	Name.	Residence.
W. A. Mack.....	Norwalk.....	D. S. Wadsworth.....	Wellington.
J. S. Oliver.....	".....	S. W. Sutherland.....	Smithfield.
M. H. Pebbles.....	".....	John Holmes.....	Connotton, O.
I. W. Bostwick.....	".....	J. B. Baxter.....	Hopedale.
F. G. Lockwood.....	Milan.....	Joel Wood.....	Martin's Ferry.
J. W. Wickham, Jr.....	Huron.....	R. H. Cochran.....	Wheeling, W. V.
Joseph Bell.....	Wheeling.....		

## CAPITAL STOCK.

Capital stock authorized by law—

Amount—common..... \$5,250,000 00

Number of shares—common..... 105,000

Par value of each—common..... 50 00

Capital stock authorized by vote of company—common..... 5,250,000 00

Total paid in capital stock—common, approximate..... \$172,895 00

Capital stock issued, and on what account, as follows:

For subscriptions paid in cash, services rendered and original construction, total..... 172,895 00

Amount of stock held by stockholders June 30, 1880, approximate..... 172,000 00

Agents authorized to transfer stock: Farmers' Loan and Trust Co., New York City.

## FUNDED DEBT.

Kind of bond or obligation—First mortgage bonds; if and how secured, first mortgage; date of issue, November 1, 1879; when due, November 1, 1809; rate of interest, 6 per cent.; total amount of authorized issue, \$3,500,000; total amount actually issued, \$84,000.00.

## COST OF ROAD EQUIPMENT, Etc.

## CONSTRUCTION ACCOUNT.

Expenditures for the year ending June 30, 1881:

Right-of-way, approximate.....	\$100,000 00
Civil engineering.....	27,645 62
Grading and masonry.....	180,452 05
Bridges, timber and ties.....	149,155 66
Superstructure and freight on material.....	30,638 04
Fencing.....	3,000 14

Total expenditures for construction.....	\$438,891 51
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## CHARACTERISTICS, ETC.

## PROPOSED LINES.

From Wheeling via Norwalk to Toledo .....	210 miles
From Norwalk to Huron .....	13 "
Length graded, not laid with rail, approximated.....	50 "
Proposed gauge, 4 feet 8½ inches.	

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	4 feet 8½ inches.
Grade—Maximum, per mile.....	60 feet.
Longest maximum.....	3,000 "
Aggregate length of maximum .....	3,000 "
Curvature—Shortest radius.....	716 "
Aggregate length of shortest radius.....	450 "
Aggregate length of all radii.....	15,574 "
Rail—Steel—On road .....	12 miles.
Average weight per yard.....	56 lbs.
Ties—Average number per mile.....	3,000
Number laid during the year .....	36,000

## BRIDGES, TRESTLES, ETC., IN OHIO.

Bridges—Combination, 2; greatest age, 1 month; aggregate length, 224 feet.
Trestles—2; greatest age, 2 months; greatest height, 25 ft.; greatest length, 400; aggregate length, 750 ft.
Length of shortest span of truss, 52.5 feet; of longest, 72 feet.
Greatest space between cross ties upon bridges and trestles, 16 inches; length of ties, 10 feet.
Number of track stringers—On trestles, 6; on bridges, 2.
Are all bridges and trestles provided with guard rails? Yes.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?  
 New York, Pennsylvania and Ohio Railroad at Pike Station, Wayne county, Ohio.

## DOINGS OF THE YEAR ENDING JUNE 30TH.

Bridges built in Ohio, as follows:

Location or how designated.	Construction.	Material.	Length.
Black River.....	Combination.....	Wood and iron.....	72 feet.
Spencer Creek.....	" .....	" .....	52 ft. 6 in.

Trestles built in Ohio, 2; aggregate length, 750 feet.

Rail laid—Steel, 56 pounds per yard—miles of track, 12.



*State of Ohio, County of Huron, ss.:*

James S. Oliver, General Manager and Superintendent of the Wheeling and Lake Erie Railroad Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the 30th day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

Subscribed and sworn to before me, this 13th day of October, A. D. 1881.

[SEAL]

J. S. OLIVER,

*Gen'l Manager and Sup't.*

D. H. YOUNG<sup>1</sup>

*Notary Public, Huron county, Ohio.*

REPORTS OF  
INCLINED PLANE RAILWAYS.

## CINCINNATI AND CLIFTON INCLINED PLANE RAILROAD.

Name of road: Cincinnati and Clifton Inclined Plane Railroad.

By whom owned: Cincinnati Street Railway Company.

By whom operated: Cincinnati Street Railway Company.

By what authority: Consolidation, July 1, 1880.

Name of Company making this report: Cincinnati Street Railway Company.

General office at Room 6, N. W. corner 5th and Walnut Sts., Cincinnati, Ohio.

Principal office in Ohio at Room 6, N. W. corner 5th and Walnut Sts., Cincinnati, O.

Address correspondence relating to this report to James A. Collins, Auditor, at Room 6, N. W. corner 5th and Walnut Sts., Cincinnati, Ohio.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

The Cincinnati & Clifton Inclined Plane R. R. Co. being consolidated with other companies, forming the Cincinnati Street Railway Company, does not keep up separate organization.

### CAPITAL STOCK.

Capital stock authorized by law—Amount—common.....	\$300,000
Number of shares—common .....	6,000
Par value of each—common .....	\$50

### COST OF ROAD EQUIPMENT, Etc.

#### CONSTRUCTION ACCOUNT.

Expenditures prior to July 1st, 1880—Incline Plane and depots.....	\$84,138 86
Street Railroad track.....	43,113 24
Bellevue House and terrace.....	39,921 89
Total expenditures for construction .....	\$167,173 99

#### COST OF EQUIPMENT OWNED BY COMPANY.

1 stationary engine.....	\$6,000 00
2 elevator cars.....	1,800 00
14 street cars .....	12,600 00
79 horses.....	7,890 18
Harness, &c.....	1,017 05
Total cost of railroad equipment owned by company.....	\$29,307 23

LINE IN OPERATION.

	Length.	In Ohio.
Single main track, Head of Elm street to Burnet Woods Park...	3.34	3.34
Length in Ohio, distributed as follows:		

All in Hamilton county: Total main track, 3.34.

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	5 ft. 2½ in.
Rail—Iron—On road.....	3.34 miles.
Average weight per yard.....	42 lbs.

## TRANSPORTATION.

Passengers—Number carried—street railroad.....	550,980
inclined plane .....	855,589
Total.....	1,406,569
Average amount received for each.....	4 15c.

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30.

## EARNINGS.

Passenger transportation—street railroad.....	\$16,311 16
inclined plane.....	42,105 10
Total.....	<u>\$58,416 26</u>

OPERATING EXPENSES.

Inclined plane.....	\$15,374 82	
Street railroad (estimated).....	13,048 93	
	<hr/>	
Total operating expenses .....		\$28,423 75
		<hr/>
Net income over operating expenses and rents paid (est'd partly)		\$29,992 51

State of Ohio, County of Hamilton, ss.:

John Kilgour, Vice President of the Cincinnati Street Railway Company, owner of the Cincinnati and Clifton Inclined Plane Railroad, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

JOHN KILGOUR,

*Vice President Cincinnati Street Railway Co.*

Subscribed and sworn to before me this 1st day of September, A. D. 1881.

[SEAL.]

N. MARCHANT, *Notary Public.*

# CINCINNATI INCLINED PLANE RAILWAY COMPANY.

Name of road: Cincinnati Inclined Plane Railway.

By whom owned: Cincinnati Inclined Plane Railway Company.

By whom operated: Cincinnati Inclined Plane Railway Company.

Name of person making this report: J. M. Doherty, Superintendent Cincinnati Inclined Plane Railway Company.

General office at Cincinnati, O.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
George A. Smith.....	President .....	Cincinnati, O.....	.....
James M. Doherty.....	Secretary .....	" .....	.....
Joseph S. Hill.....	Treasurer .....	" .....	.....
James M. Doherty.....	General Superintendent...	" .....	\$3,000
George A. Smith.....	} Executive Committee {	" .....	.....
Jos. S. Hill.....		" .....	.....
Jas. M. Doherty.....		" .....	.....
Total salaries.....	.....	.....	\$3,000

## DIRECTORS.

Name.	Residence.	Name.	Residence.
George A. Smith.....	Cincinnati, O...	M. L. Doherty.....	Cincinnati, O.
Jos. S. Hill.....	" .....	Wm. Wiswell .....	" .....
Jas. M. Doherty.....	" .....	H. G. Hunnewell.....	" .....
E. V. Cherry.....	" .....		

## CAPITAL STOCK.

Capital stock authorized by law: Amount—common .....	\$50,000 00
Number of shares—common..... 1,000	
Par value of each—common.....	50 00
Total paid in capital stock—common.....	10,050 00
Average amount paid in per mile of single main track (6 miles) .....	1,675 00
Stockholders, residents of Ohio, 7.	
Amount of stock held by them June 30, 1881, \$10,050.00.	

## FUNDED DEBT.

If and how secured, 1st mortgage; date of issue, July 1, 1877; when due, July 1, 1897, rate of interest, 7 per cent.; amount of authorized issue, \$150,000; amount actually issued, \$125,000.

Average amount per mile of single main track (6 miles)..... \$20,833 36

## OTHER INDEBTEDNESS.

Total unfunded debt.....	65,619 81
Increase since June 30, 1880.....	20 00

## COST OF ROAD EQUIPMENT, Etc.

Construction of road, depots, stationary engines, real estate, etc.—Expenditures prior to July 1, 1880, \$145,239.22; expenditures for the year ending June 30, 1881, \$2,035.40; total expenditures to July 1, 1881, \$147,274.66.

## COST OF EQUIPMENT OWNED BY COMPANY.

26 first-class passenger cars, 24 street cars, 2 plane cars.....	\$23,400 00
136 horses.....	17,000 00
10 mules.....	1,500 00
Harness.....	2,800 00
Tools .....	1,200 00
Total permanent investment .....	193,174 66
Average per mile (of single main track, 6 miles).....	32,195 77
Length in Ohio, distributed as follows:	
Hamilton county, double track, 3; sidings, etc., .5; total, 3.5.	

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge.....	5 $\frac{5}{8}$ feet.
Rail—Iron—Average weight per yard.....	42 lbs.

## EMPLOYES.

Superintendents .....	1
Engineers .....	2
Stablemen .....	14
Laborers.....	2
Clerks .....	2
Firemen .....	2
Mechanics .....	4
Conductors.....	28
Drivers .....	33
Collectors .....	3

Total number employed by company in operating line .....	91
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## RATES OF TRANSPORTATION.

## PASSENGERS.

	Highest.	Lowest.	Average.
Fare charged per mile—			
For distances less than 8 miles .....	5 Cts.	1½ Cts.	3½ Cts.

## TRANSPORTATION.

Passengers—Number carried, local .....	2,363,520
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## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30TH.

## EARNINGS.

Passenger transportation—local.....	\$90,195 94
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## OPERATING EXPENSES.

Maintenance of way and structures .....	\$237 27
Horses .....	2,105 00
Feed .....	11,482 81
General expenses:	
Taxes in Ohio .....	2,994 62
Salaries, wages, etc .....	41,930 85
Other general expenses of operating.....	14,091 75
Total operating expenses.....	\$72,842 33

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Sale of real estate—cars .....	\$1,600 00	
Increase of floating debt.....	1,736 30	
		\$3,336 30

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds .....	\$7,776 59	
Interest on floating debt.....	5 883 26	
Construction of new work .....	2,035 44	
		\$15,695 29

## CONDENSED GENERAL BALANCE SHEET, JULY 1, 1881.

## LIABILITIES.

Stock .....	\$10,050 00	
Original purchase .....	67,086 11	
Loan.....	270 00	
Bond account.....	125,000 00	
P. & L. G.....	4,993 86	
		\$207,399 97

## ASSETS.

Road and equipment.....	\$193,174 66
Lor. stock.....	7,500 00
Cash.....	6,725 31
	<hr/> \$207,399 97

*State of Ohio, County of Hamilton, ss.:*

James M. Doherty, Superintendent of the Cincinnati Inclined Plane Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A. D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

J. M. DOHERTY,

*Sup't Cincinnati Inclined Plane R'y Co.*

Subscribed and sworn to before me, this 12th day of October, A. D. 1881.

N. MARCHANT,

*Justice of the Peace.*

[SEAL.]



## MT. ADAMS AND EDEN PARK INCLINED RAILWAY COMPANY.

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Name of road: Mt. Adams and Eden Park Inclined Railway.

By whom owned: Mt. Adams and Eden Park Inclined Railway Company.

By whom operated: Mt. Adams and Eden Park Inclined Railway Company.

Name of company making this report: Mt. Adams and Eden Park Inclined Railway Company.

General office at Cincinnati, Ohio.

Address correspondence relating to this report to G. B. Kerper, President.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Mt. Adams & Eden Park Inclined Railway.

The capital stock of the company was originally \$500,000; it was increased October 1, 1880, to one million dollars (\$1,000,000).

The Mt. Adams Inclined Railway begins on Lock street, near Fifth street, in the city of Cincinnati, and runs to Mt. Adams.

The length of track is 1,000 feet.

The gauge of track is 7 feet 6 inches

The elevation from Lock street to Mt. Adams is 300 feet. It passes over Kilgore, Baum and Oregon streets, by iron bridges. An account of cost is given on the following pages.

Roads acquired by purchase:

The Eden Park, Walnut Hills & Avondale St. Railroad Co., October 1, 1880, purchased for \$350,000.

Length of route: Beginning at the head of the Mt. Adams Inclined Railway, running through Eden Park to the northern terminus of Walnut Hills. It is about three miles of double track. Gauge of track, 5 feet 2 inches. Number of cars on this line, 20.

Route No. 15: This line runs from Fountain Square to foot of Incline. Length of line, three quarters ( $\frac{3}{4}$ ) of a mile double track. Cost of Route No. 15, \$17,069.72.

The receipts and expenses of both these lines are included in the report of the Mt. Adams & Eden Park Inclined Railway.

## NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
G. B. Kerper .....	President .....	Cincinnati, O. ....	\$3,000
J. R. Murdock .....	Secretary .....	.....	.....
G. B. Kerper .....	Treasurer .....	.....	.....

## DIRECTORS.

Name.	Residence.	Name.	Residence.
Jas. E. Mooney .....	Cincinnati, O ...	Wm. M. Ramsey .....	Cincinnati, O.
S. M. Lemont .....	Louisville, Ky...	Wm. H. Pearce .....	"
J. R. Murdock .....	Cincinnati, O ...	G. B. Kerper .....	"

## CAPITAL STOCK.

Capital stock authorized by law—

Amount—common .....	\$1,000,000 00
Number of shares—common .....	2,000
Par value of each—common .....	\$50 00
Increase since June 30, 1880—common .....	500,000 00

Capital stock authorized by vote of company—

Amount—common .....	1,000,000 00
Amount subscribed—common .....	769,550 00
Total paid in capital stock—common .....	769,550 00
Increase since June 30, 1880—common .....	500,000 00

Capital stock issued, and on what account, as follows:

For subscriptions paid in cash—No. shares, 1,549; amount of common..	769,550 00
Stockholders, residents of Ohio, 10.	
Amount of stock held by them June 30, 1881, \$744,550.	

## FUNDED DEBT.

1. Kind of bond or obligations.	2. If and how secured.	3. Date of issue.	4. When due.	5. Rate of interest.	6. Amount of authorized issue.	7. Amount actually issued.
1st mort. 6 per cent	By mortgage .....	Oct. 1, 1880	Oct. 1, 1885	6	\$50,000 00	\$50,000 00
" "	" .....	" "	" 1890	6	50,000 00	50,000 00
" "	" .....	" "	" 1895	6	50,000 00	50,000 00
" "	" .....	" "	" 1900	6	50,000 00	50,000 00
" "	" .....	" "	" 1905	6	100,000 00	100,000 00
Total .....	.....	.....	.....	.....	\$300,000 00	\$300,000 00

EARNINGS, OPERATING EXPENSES, ETC., FROM NOVEMBER 1, 1880, TO  
SEPTEMBER 1, 1881, TEN MONTHS.

## EARNINGS.

Passenger transportation—local .....	\$91,324 22
Total operating expenses.....	59,676 50
Net earnings .....	31,647 72

## CONDENSED GENERAL BALANCE SHEET, SEPTEMBER 1, 1881.

## LIABILITIES.

First mortgage bonds.....	\$300,000 00
Capital stock.....	769,550 00
Bills payable .....	11,011 35
Accounts payable.....	4,499 01
	<hr/> \$1,085,060 36

## ASSETS.

Real estate .....	\$408,622 88
Inclined Railway, stations and machinery.....	193,171 60
Route No. 15, Street Passenger Railway .....	17,069 72
Route No. 16, " " " .....	350,000 00
Ticket account.....	15,432 69
City of Cincinnati.....	8,750 00
Discount on stock.....	78,638 63
Accounts receivable.....	5,686 55
Cash on hand.....	7,688 29
	<hr/> \$1,085,060 36

*State of Ohio, County of Hamilton, ss.:*

George B Kerper, President of the Mt. Adams and Eden Park Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declare them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D., 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

G. B. KERPER,

*President.*

Subscribed and sworn to before me, this 6th day of October, A. D. 1881.

[SEAL.]

MATHEW J. DAY,

*Notary Public, Hamilton County, O.*

## PRICE HILL INCLINED PLANE RAILWAY.

Name of road : Price Hill Inclined Plane Railway.

By whom owned : John E. Price, Rus E. McDuffie, Geo. T. McDuffie.

By whom operated : John E. Price, Rus E. McDuffie, Geo. T. McDuffie.

Only office at Price Hill, Cincinnati, Ohio.

Address correspondence relating to this report to Rus E. McDuffie, Price Hill, Cincinnati, Ohio.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

Plane built during fall of 1874 and spring of 1875. Commenced running regularly July 14, 1875. Was operated by Wm. Price, Esq., until October 1, 1878, and after that by the present company.

Is not an incorporated company, and has not elected a President or any regular officers.

### COST OF ROAD EQUIPMENT, ETC.

	Expenditures prior to July 1, 1880.
Grading and masonry.....	\$10,000 00
Bridges .....	
Timber and ties.....	
Superstructure .....	
Iron rails.....	
Passenger and freight stations.....	9,000 00
Engine and car houses.....	

### COST OF EQUIPMENT OWNED BY COMPANY.

5 locomotives.....	\$9,000 00
2 passenger cars .....	300 00
2 platform cars. ....	300 00
Tools and supplies.....	100 00
Real estate used by buildings and track.....	3,730 00

### EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30TH

#### OPERATING EXPENSES.

Total expense of operating, per year .....	\$17,000 00
Taxes in Ohio, per year.....	1,600 00
Total operating expenses, being 80 per cent. of earnings.	



REPORTS OF PRIVATE RAILWAYS.

## ANTWERP AND PUCKERBRUSH RAILROAD.

Name of road: Antwerp and Puckerbrush Railroad.

By whom owned: Thomas G. Fitzsimmons.

By whom operated: Thomas G. Fitzsimmons.

By what authority: Ownership.

Name of person making this report: Thomas G. Fitzsimmons, Antwerp and Puckerbrush Railroad Company.

Principal office in Ohio at Antwerp.

Address correspondence relating to this report to Thos. G. Fitzsimmons, at Antwerp, Ohio.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Thos. G. Fitzsimons .....	President .....	Antwerp .....	\$100
“ .....	Traffic Manager.....	“ .....	200
“ .....	General Superintendent...	“ .....	300

### COST OF EQUIPMENT OWNED BY COMPANY.

1 locomotive.....	\$1,200
8 platform cars .....	600
1 hand car .....	50
All other rolling stock, tools, machinery, etc .....	1,850
Total cost of railroad equipment owned by company .....	12,000
Average amount per mile (of single main track, 4 miles).....	3,000
Proportion for Ohio, 4 miles.	
Total for road and equipment.....	12,000
Proportion of same for Ohio.....	12,000

### CHARACTERISTICS, Etc.

#### PROPOSED LINES.

From Antwerp, via Swamptown to Woodpile..... 3½ mi.

#### LINE IN OPERATION.

	Length.	In Ohio.
Single main track.....	3½ miles.	All.

## ROLLING STOCK.

Locomotives.....	1;	average weight.....	18,000
Freight cars.....	8;	" .....	3,000
Kind of brake: No kind.			
Number of cars equipped with train brakes, 3.			
Are all cars run on this road heated and lighted as prescribed by law? No.			
State methods of heating cars used for the transportation of passengers: Every person to bundle up good on cold days or keep off.			

## TRANSPORTATION.

Passengers—Total number carried, through.....	3,000
Average number of miles traveled by each.....	3½
Average amount received for each, nothing.	
Freight—Total tons carried, through .....	3,000
Average tons in each loaded car per trip .....	4½
Total movement, or tons carried one mile .....	100,000
Average amount <i>per mile</i> received for each ton.....	3 cts.
Average cost per ton freight per mile.....	3 "
Average amount received for each ton through freight.....	3 "

Articles transported:	Tons.	Per cent.
Wood.....	30,000	100

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 30TH.

## OPERATING EXPENSES.

Conducting transportation .....	\$12,000 00
General expenses:	
Taxes in Ohio.....	300 00
Total operating expenses, being 100 per cent. of earnings.	
Net earnings of 3½ miles operated, nothing.	

## CONDENSED GENERAL BALANCE SHEET JULY 1, 1881.

Liabilities, none.

## ASSETS.

160 tons old rails, iron.....	\$5,000 00
1 old locomotive .....	1,200 00
8 cars.....	600 00
1 hand-car .....	50 00
Right-of-way .....	100 00
Road-bed .....	250 00
Total .....	\$7,200 00



## HAYDENVILLE BRANCH RAILWAY.

Name of road: Haydenville Branch Railway.

By whom owned: Peter Hayden.

By whom operated: Peter Hayden.

Name of person making this report: Peter Hayden. "J."

General office at Haydenville, Ohio.

Principal office in Ohio at Haydenville.

Address correspondence relating to this report to Peter Hayden, at Haydenville.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

The Haydenville Branch Railway was built by Peter Hayden in the year 1869, for the purpose of carrying coal freight from his coal mines located in Green and Ward townships, of Hocking county, Ohio, to the C. H. & V. Railway; the point of junction being in the north-west corner of section twelve, Starr township, of Hocking county. Since the building of the road it has been operated, kept in repair, and taxes paid by Peter Hayden.

At time of building, the road was nearly all on lands belonging to the builder, since which time most of that not then owned by him has been acquired.

### COST OF ROAD EQUIPMENT, Etc.

#### CONSTRUCTION ACCOUNT.

Right-of-way .....	\$600 00
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#### COST OF EQUIPMENT OWNED BY P. HAYDEN.

2 locomotives .....	\$14,000 00
6 dump cars .....	3,000 00
All other rolling stock, 100 four-wheel coal cars .....	35,000 00
135 eight-wheel coal cars .....	54,000 00
One " water car .....	400 00
One " log car .....	400 00

### CHARACTERISTICS, Etc.

#### GAUGE, GRADE, CURVATURE, RAILS, ETC.

Gauge .....	56½ inches.
Rail—Iron—On road .....	2 miles.
Average weight per yard .....	60 lbs.
Ties—Average number per mile .....	2,500
Number laid during the year .....	1,000

## TRANSPORTATION.

Articles transported :	Tons.
Coal.....	100,000
Fire clay .....	250
Ores.....	100

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THE SALINEVILLE BRANCH RAILROAD.

Location of principal office, Cleveland, Ohio.

This is a private road, and is not owned by a corporation. It is used in transporting coal from the mines to the Cleveland & Pittsburgh Railroad at Salineville Station.

## LINE OPERATED.

Length of road operated,  $3\frac{1}{2}$  miles.

## ROAD CONSTRUCTED BY OWNERS.

Right of way and fencing—monthly donated .....	\$800
Engine house, etc.....	400
Miscellaneous.....	28,800

Total expenditures for construction.....	\$30,000
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Locomotives used, 1; weight, 28 tons; owned by James Farmer.

Bridges, 2, wood; 100 feet span each.

Rails used on road, 60 pounds per yard.

Equipment, none.

Cars used, belong to other roads.

Speed of trains, 10 miles per hour.

## EMPLOYES.

Superintendents.....	1
Engineers.....	1
Brakemen .....	1
Laborers .....	2

Total number employed in operating line.....	5
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## DOINGS FOR THE YEAR.

Fuel consumed—wood, 55 cords.....	}	\$320
“ coal, 320 tons.....		
Total operating expenses.....		5,000

## OWNERS.

James Farmer.....	Cleveland, Ohio.
Beulah R. Price.....	“
Ellen F. Price.....	Newark, N. Y.
Allen Jones.....	Hartford, N. Y.
General Superintendent, James Farmer.	

## SHERIDAN MINING COMPANY'S ROAD.

Name of road: Sheridan Mining Company.  
 By whom owned: Same.  
 By whom operated: Trustees Sheridan Mining Company.  
 Name of company making this report: Trustees Sheridan Mining Company.  
 General office at Sheridan Coal Works, Ohio.  
 Principal office in Ohio at Sheridan Coal Works, Ohio.  
 Address correspondence relating to this report to Sheridan Coal Works, Ohio.

## HISTORY OF ORGANIZATION AND CONSTRUCTION.

This short road belongs to the Sheridan Mining Company, whose business is conducted by the Trustees of the Sheridan Mining Company. Road is used for delivering coal from their mines to the Ohio river. No changes during last year. Has been constructed for some time—no account kept of its construction. Built in 1864—part 1879. It has no capital, as it belongs to the company.

## COST OF ROAD AND EQUIPMENT, Etc.

## COST OF EQUIPMENT OWNED BY COMPANY.

Box freight cars, 33.....	\$660 00
Wrecking cars.....	10 00
All other rolling stock, tools, machinery, etc.....	670 00

## CHARACTERISTICS, Etc.

## LINE IN OPERATION.

	Length.
Single main track.....	1
Aggregate of sidings and other tracks .....	$\frac{1}{8}$
Total length laid with rail computed as single track.....	$1\frac{1}{8}$

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Rail—Iron—On road.....	$1\frac{1}{4}$ miles.
Ties—About 18 inches apart.	

## BRIDGES, TRETTLES, ETC., IN OHIO.

Trestles—2; greatest age, 5 years; greatest height, 50 feet; greatest length, 100 feet; aggregate length, 135 feet.	
Length of shortest span of truss, 6 feet; of longest, 7 feet; greatest length of beams between points of support, if not trussed, 6 feet 6 inches.	
Greatest space between cross ties upon bridges and trestles, 30 inches; length of ties, 6 feet 6 inches.	
Number of track stringers, 2.	
Are all bridges and trestles provided with guard rails? The long one is.	
Do all bridges and trestles receive stated examinations? Yes.	
How often? Every day or so.	
Are the examinations analytical, and are they made by a competent person? By competent persons.	

## CROSSINGS.

Number of crossings of highways over railroad.....	2
“ “ “ under railroad.....	7

## STATIONS AND TELEGRAPH.

## TELEGRAPH LINE.

Miles on line of road operated.....	$1\frac{1}{8}$
Miles of same owned by railroad company.....	$1\frac{1}{8}$

## EMPLOYES.

Total number employed by company in operating line.....	3
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## AVERAGE LIFE OF LOCOMOTIVES, CARS, RAILS, TIES, BRIDGES, ETC.

Equipment and superstructure.	Average life in years.
Cars—Coal .....	5

## ROLLING STOCK.

Freight cars.....	33
Number of cars equipped with train brakes .....	33
Kind: Hand brake.	

## SPEED OF TRAINS.

Freight trains .....	4 miles per hour.
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## TRANSPORTATION.

Freight—Tons carried, through .....	30,000
Average tons in each loaded car per trip .....	4
Articles transported :	
Coal .....	Tons. 30,000

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 30TH.

## OPERATING EXPENSES.

Maintenance of way and structures .....	\$50 00
Maintenance of cars.....	15 00
Motive power, mules .....	300 00
Conducting transportation.....	300 00

*State of Ohio, County of Lawrence, ss.:*

Trustees Sheridan Mining Co. depose and say that they caused the foregoing statements to be prepared by the proper officers and agents of this company, and, having carefully examined the same, declare them to be a true, full, and correct statement of the condition and affairs of said company on the thirtieth day of June, A. D. 1881, to the best of their knowledge and belief.

(Signed)

[SEAL OF R. R.]

TRUSTEES SHERIDAN MINING CO.

July 9, A. D. 1881.

## YOUNGSTOWN AND AUSTINTOWN RAILWAY.

Name of road: The Youngstown and Austintown Railway.

By whom owned: The Leadville Coal Company.

By whom operated: The Leadville Coal Company.

General office at Youngstown, Ohio.

Principal office in Ohio at Youngstown, Ohio.

Address correspondence relating to this report to Caleb B. Wick, General Manager, at Youngstown, O.

### HISTORY OF ORGANIZATION AND CONSTRUCTION.

This road was built in the years 1871 and 1872, by Wicks & Well and the Packard Coal Company, to haul coal from their mines to connect with other railroads then built.

The Packard Coal Company works were abandoned, and the Leadville Coal Company is operating what was known as Wicks' & Wells' mine, and purchased the road from Wicks & Wells and the Packard Coal Company. They use the same for hauling their coal, and for no other purpose.

### NAME, TITLE, AND ADDRESS OF OFFICERS.

Name.	Office.	Address.	Salary.
Harry I. Higgins.....	President .....	Chicago, Ill.....	.....
F. H. Matthews .....	Secretary .....	Youngstown, O.....	.....
Caleb B. Wicks.....	Treasurer .....	" .....	.....
Caleb B. Wicks.....	General Manager .....	" .....	.....

### DIRECTORS.

Name.	Residence.	Name.	Residence.
Henry I. Higgins.....	Chicago, Ill .....	R. J. Wicks.....	Youngstown, O.
Caleb B. Wicks .....	Youngstown, O.. ..	H. C. Ayer .....	Chicago, Ill.
F. H. Matthews .....	" ..	C. A. Otis.....	Cleveland, O.
Chas. L. Rhodes.....	" ..		

## CAPITAL STOCK.

## CAPITAL STOCK AUTHORIZED BY VOTE OF COMPANY.

Amount—common .....	\$100,000 00
Amount subscribed—common .....	10,500 00
Total paid in capital stock—common .....	10,500 00
Stockholders, residents of Ohio, 5.	

## COST OF ROAD EQUIPMENT, ETC.

Purchased the road after it was constructed.

## CHARACTERISTICS, ETC.

## LINE IN OPERATION.

Single main track—length, 3.10 miles. .

## GAUGE, GRADE, CURVATURE, RAILS, ETC.

Rail—Iron, average weight per yard, 60 lbs.

## CROSSINGS.

What railroads cross your road at grade in this State, and at what locality?

Painesville and Youngstown Railroad at the west side of Mahoning river.

Do all trains stop at railroad crossings as required by law? Yes.

*State of Ohio, County of Mahoning. ss:*

Caleb B. Wicks, General Manager of the Youngstown and Austinvile Railway Company, being duly sworn, deposes and says that he caused the foregoing statements to be prepared by the proper officers and agents of this company, and having carefully examined the same, declares them to be a true, full, and correct statement of the condition and affairs of said company, on the thirtieth day of June, A.D. 1881, to the best of his knowledge and belief.

(Signed)

[SEAL OF R. R.]

CALEB B. WICKS,

*General Manager.*

Subscribed and sworn to before me, this 25th day of July, A.D. 1881.

B. S. HIGLEY,

[SEAL]

*Notary Public.*

REPORTS OF TELEGRAPH LINES.



## AMERICAN DISTRICT TELEGRAPH COMPANY.

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Location of principal office of the company: 167 Vine street, Cincinnati, Ohio.  
Address correspondence relating to this report to Manager American District Telegraph Company at Cincinnati, Ohio.

Date of incorporation: March 5, 1878.

Under laws of what State or States: Ohio.

Incorporated under general or special law: General.

Changes since original incorporation up to June 1, 1881: None.

### CHARACTERISTICS OF THE LINE.

This company puts in call boxes for the purpose of summoning messenger boys to perform errands; also to summon city fire department and police.

Total length of lines, 16 miles.

Length of wire—entire line—galvanized, 16.

Increase within the year ending June 1, 1 mile.

Number of poles to the mile: Do not use poles, but run over house tops.

Number of stations—entire line, 1; in Ohio, 1.

Number of persons employed in operating and maintaining the line—entire line, 69.

### EXPENSE AND CONSTRUCTION ACCOUNT.

All expenditures for construction, etc., for the year ending June 1, 1881, inclusive:

Wire.....	\$57 50
Instruments.....	530 00
Other material used .....	175 50
Salaries paid .....	315 50
Contingent expenses .....	65 50
Expenses not included in the above.....	75 00

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Total ..... \$1,218 50

### ORIGINAL COST OF LINE, EQUIPMENT, Etc.

#### LINE CONSTRUCTED BY COMPANY.

Our works were originally constructed by another company, and as we have no account of what they paid, we can only estimate that the entire construction account was about \$15,000.

## STOCK AND DEBT.

## CAPITAL STOCK.

Amount authorized—general.....	\$75,000 00
Amount subscribed ....	75,000 00
Amount issued.....	75,000 00
Par value of shares.....	\$160 00
Amount paid in—general.....	All.
Stockholders residents of Ohio, 9.	
Amount of stock held by them June 1, 1881, \$56,000.00	
Agents authorized to transfer stock: J. C. Hall, Cincinnati, Ohio.	

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 1st.

## EARNINGS.

Transmission of messages: Do not transmit.	
Total earnings of line operated included in this report—other sources.....	\$20,153 71

## OPERATING EXPENSES.

All expenses other than salaries included in general expense. See below.

Salaries .....	\$13,053 71
Other general expenses of operating.....	3,379 86
Rentals paid: None but office rent, \$75 per month, included in general expenses.	
Per mile of operating expenses .....	\$16,433 57
net earnings.....	3,720 30

## OFFICERS.

Directors—George L. Phillips.....	Boston, Mass.
L. C. Weir.....	Cincinnati, Ohio.
C. A. Phillips .....	Dayton, Ohio.
George W. Baleh.....	Detroit, Mich.
J. C. Hall.....	Cincinnati, Ohio.
President—George L. Phillips.	
Vice President—L. C. Weir.	
Secretary—J. C. Hall.	
Treasurer—George L. Phillips.	
General Manager—J. C. Hall.	

*State of Ohio, County of Hamilton, ss.:*

Personally appeared before me, a Notary Public in and for said county, J. C. Hall, Manager of the American District Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the first day of June last, are true and correct as he verily believes.

J. C. HALL.

Subscribed and sworn to before me, at Cincinnati, this 4th day of August, A.D. 1881.

J. Z. BRUCE,

*Notary Public as aforesaid.*

## AMERICAN UNION TELEGRAPH COMPANY.

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Location of principal office of company: New York City.

Principal office in Ohio, at Cleveland.

Address correspondence relating to this report, to Thomas F. Clark, Secretary,  
at New York City.

Date of incorporation, 1879.

Under laws of what State or States: New York and several others.

Incorporated under general or special law: General.

### CHANGES SINCE ORIGINAL INCORPORATION UP TO JUNE 1, 1881.

In the month of January, 1881, this company sold all its property, lines, leases, franchises, and contracts, to the Western Union Telegraph Company. No separate business was transacted after said month of January, 1881.

### STOCK AND DEBT.

#### CAPITAL STOCK.

Amount authorized—general.....	\$10,000,000 00
Amount issued.....	10,000,000 00
Par value of shares.....	\$100

### EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 1st.

Operated as part of the lines of the Western Union Telegraph Company, and dividends were paid after January, 1881, at the rate of six per cent. on the par value of the stock.

### OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

Nothing under this head—no records after sale in January, 1881.

### CONDENSED GENERAL BALANCE SHEET, JUNE 1, 1881.

Liabilities—Capital stock issued.....	\$10,000,000
bonds " .....	5,000,000

All sold to Western Union Telegraph Company, which assumes all debts of this company.

## OFFICERS.

Directors—Jay Gould.....	New York City.
Norvin Greene.....	"
Augustus Schell.....	"
C. D. Morgan.....	"
H. Durkee.....	"
Fred. Ames.....	"
F. Gordon Dexter.....	"
George J. Gould.....	"
W. C. Conner.....	"
Sidney Dillon.....	"
D. H. Bates.....	"
Thomas T. Eckert.....	"
Russell Sage.....	"
President, Thos. T. Eckert.....	"
Vice President, D. H. Bates.....	"
Secretary, Thos. F. Clark.....	"
Treasurer, G. P. Morrison.....	"

*State, City and County of New York, ss.:*

Personally appeared before me, a Notary Public in and for said county, Thomas F. Clark, Secretary of the American Union Telegraph Company, who being duly sworn, deposes and says that the foregoing statements of the affairs of said Company, on the first day of June, 1881, are true and correct as he verily believes, according to the best of his knowledge and information.

THOS. F. CLARK.

Subscribed and sworn to before me at New York, this 19th day of June, A. D. 1882.

WM. ARNOUX,

*Notary Public Kings and New York Counties.*

## ATLANTIC AND PACIFIC TELEGRAPH COMPANY.

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Location of principal office of company: 195 Broadway, New York City.

Principal office in Ohio: None.

Address correspondence relating to this report to R. H. Rochester, Treasurer, at New York City.

Date of incorporation: December 20, 1865.

Under laws of what State or States: New York and United States.

Incorporated under general or special law: General.

### CHANGES SINCE ORIGINAL INCORPORATION UP TO JUNE 1, 1881.

In the month of January, 1881, this company sold all its property, lines, leases, franchises and contracts to the Western Union Telegraph Company, and no separate business was transacted after said month of January, 1881.

### STOCK AND DEBT.

#### CAPITAL STOCK.

Amount authorized—general.....	\$15,000,000 00
Amount issued.....	14,000,000 00
Par value of shares.....	100 00
Agents authorized to transfer stock: William H. Baker, 195 Broadway, New York City, and Farmer' Loan and Trust Company, New York City.	

No funded debt.

### OTHER INDEBTEDNESS.

This company has no debts other than its current accounts outstanding with its officers, agents, connections, etc., and some taxes.

### OPERATING EXPENSES.

Operated as part of the lines of the Western Union Telegraph Company and dividends were paid at the rate of 3 and  $\frac{3}{4}$  per cent. on the par value of the stock.

### CONDENSED GENERAL BALANCE SHEET, JUNE 1, 1881.

#### LIABILITIES.

Capital stock issued.....	\$14,000,000 00
All sold to Western Union Telegraph Company which assumed all debts of this company.	

## . OFFICERS.

Directors—Norvin Green.....	New York City
Harrison Durkee.....	"
E. D. Morgan.....	"
Thos. T. Eckert.....	"
Augustus Schell.....	"
John Van Horne.....	"
D. H. Bates.....	"
Jay Gould.....	"
Russell Sage.....	"
President, Norvin Green.....	"
Vice President, Thos. T. Eckert.....	"
Secretary, Wm. H. Baker.....	"
Treasurer, R. H. Rochester.....	"

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*State of New York, City and County of New York, ss.:*

Personally appeared before me, a Notary Public in and for said county, R. H. Rochester, Treasurer of the Atlantic and Pacific Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes, according to the best of his knowledge and information.

R. H. ROCHESTER.

Subscribed and sworn to before me, at New York, this 17th day of May, A. D. 1882.

[SEAL.]

WM. ARNOUX,

*Notary Public, Kings and New York Counties.*

## CINCINNATI AND EASTERN TELEGRAPH COMPANY.

Location of principal office of the company: Batavia, Clermont county, Ohio.

Principal office in Ohio at Batavia, Clermont county, Ohio.

Address correspondence relating to this report to J. F. Dial, Secretary, at Batavia, Clermont county, Ohio.

Date of incorporation: February 24, 1877.

Under laws of what State or States: Ohio.

Incorporated under general or special law: General.

### CHANGES SINCE ORIGINAL INCORPORATION UP TO JUNE 1, 1881.

Contract with Western Union Telegraph Company, modified so that the Cincinnati and Eastern Telegraph Company's share of earnings is forty per cent. of receipts of telegraph business of Cincinnati and Eastern telegraph offices with Western Union Telegraph offices, and forty per cent. of Western Union Telegraph office's receipts from business with offices of the Cincinnati and Eastern Telegraph Company.

### CHARACTERISTICS OF THE LINE.

	Entire line.	In Ohio.
Single main line—Clenny, O., to Winchester, O.....	53. mi.	53. mi.
Batavia Junction, O., to New Richmond, O.....	17.19	17.19

Total single main line..... 70.19 mi. 70.19 mi.

Length of wire—entire line—plain, 47.54; galvanized, 22.65; total, 70.19 miles.

Length within the State of Ohio—plain, 47.54; galvanized, 22.65; total, 70.19 miles.

Increase within the year ending June 1st, 5.46 miles.

Number of poles to the mile, 30.

Number of stations—entire line (all in Ohio), 11.

Number of persons employed in operating and maintaining the line—entire line (all in Ohio), 11.

### EXPENSE AND CONSTRUCTION ACCOUNT.

ALL EXPENDITURES FOR CONSTRUCTION, ETC., FOR THE YEAR ENDING JUNE 1, 1881, INCLUSIVE.

Poles .....	\$139 35	
Wire.....	101 85	
Instruments.....	40 00	
Contingent expenses.....	218 80	
Expenses not included in the above .....	9 35	
Total.....		\$509 35

## ORIGINAL COST OF LINE EQUIPMENT, Etc.

## LINE CONSTRUCTED BY COMPANY.

Posts.....	\$1,115 30	
Wire.....	1,425 14	
Instruments .....	287 46	
Office fixtures and other materials used.....	342 13	
Paid for salaries and labor.....	511 08	
Interest and discount paid during construction.....	94 45	
Other items of cost not included in the above.....	746 09	
		<hr/>
Total expenditures by company for construction .....		\$4,490 65
Subsequent expenditures for construction.....		509 35
		<hr/>
Total subsequent expenditures for construction .....		\$5,000 00
Average cost per mile of line constructed.....	\$71 23	
Average cost per mile of line owned by company .....	71 23	
Proportion of same for Ohio .....	71 23	

## STOCK AND DEBT.

## CAPITAL STOCK.

Amount authorized—general .....	\$10,000 00	
Increase since June 1, 1880 .....	500 00	
Amount subscribed .....	5,000 00	
Amount issued.....	5,000 00	
Par value of shares .....	\$100	
Total paid in capital stock.....		\$5,000 00
Increase since June 1, 1880 .....	\$500 00	
Average amount paid in per mile (70.19 miles).....	71 23	
Proportion of same for Ohio (70.19 miles).....	71 23	
Stockholders, residents of Ohio, 8.		
Amount of stock held by them June 1, 1881 .....	5,000 00	
Agents authorized to transfer stock: M. Jamison and J. F. Dial, Batavia, O.		
Number of shares transferred within the year at such agencies, 9.		

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 1.

## EARNINGS.

Transmission of messages .....	\$1,537 40
Total earnings of line operated included in this report.....	1,537 40

## OPERATING EXPENSES.

General expenses, as follows:

Taxes—Ohio .....	\$20 84
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Salaries .....	249 32	
Other general expenses of operating.....	80 31	
Total operating expenses, being 23.8 per cent. of earnings.....		\$350 47
Net earnings of 70.19 miles operated.....		\$1,186 93
Rentals paid (the proportion due Western Union Tel. Co.).....		314 37
Net income over operating expenses and rents paid.....		\$872 56
Percentage of same to capital stock and debt, 17.45.		
Per centage of to total means applied to construction; etc., 17.45.		
Per mile of earnings.....	\$21 90; Proportion for Ohio.....	\$21 90
operating expenses	5 00; " "	5 00
net earnings.....	\$16 90; " "	\$16 90

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Payments on capital stock.....	\$500 00
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Dividends, rate 6 and 5 per cent. on general stock of \$4,500 ...	\$495 00	
Last dividend declared on general stock, Mar. 7, 1881, on \$4,500	225 00	
Construction of new work.....	509 35	
		\$1,239 35

## CONDENSED GENERAL BALANCE SHEET, JUNE 1, 1881.

## LIABILITIES.

Capital stock .....	\$5,000 00	
Telegraph receipts.....	863 50	
		\$5,863 50

## ASSETS.

Construction account .....	\$5,000 00	
Expenses paid.....	32 46	
Cash on hand .....	831 04	
		\$5,863 50

## OFFICERS.

Directors—M. Jamison.....	Batavia, Clermont county, Ohio
John Jamison.....	“ “
Wm. Mansfield .....	“ “
J. F. Dial.....	“ “
S. Feike.....	Sardinia, Brown county, Ohio.
President, M. Jamison, Batavia, Ohio.	
Secretary and Treasurer, J. F. Dial, Batavia, Ohio.	

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*State of Ohio, County of Clermont, ss.:*

Personally appeared before me, a Notary Public in and for said county, J. F. Dial, of the Cincinnati and Eastern Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes.

J. F. DIAL,

*Secretary and Treasurer.*

Subscribed and sworn to before me, at Batavia, Ohio, this 26th day of July,  
A. D. 1881.

JAS. B. SWING,

*Notary Public for said county.*

## THE CITY AND SUBURBAN TELEGRAPH ASSOCIATION.

Location of principal office of the company: Cincinnati, Ohio.

Principal office in Ohio at Cincinnati, Ohio.

Address correspondence relating to this report to W. H. Eckert, General Manager, at Cincinnati, O.

Date of incorporation: July 1, 1873.

Under laws of what State or States: State of Ohio.

Incorporated under general or special law: General law.

### PROPOSED BRANCHES AND EXTENSIONS.

From Cincinnati to Hamilton, 20 miles.

### CHARACTERISTICS OF THE LINE.

Single Main Line—poles.	Entire line.	In Ohio.
Cincinnati to Hamilton, O.....	20	
Cincinnati and Hamilton county.....	184	204
Length within the State of Ohio—galvanized.....		2,393
Increase within the year ending June 1st.....		820 miles.
Number of poles to the mile.....		35
Number of persons employed in operating and maintaining the line— entire line, in Ohio.....		100

### EXPENSE AND CONSTRUCTION ACCOUNT.

All expenditures for construction, etc., for the year ending June 1, 1881, inclusive:

Poles.....	\$11,361 06
Wire.....	12,873 51
Instruments and wells .....	3,593 13
Other material used.....	14,755 84
Salaries paid labor .....	15,891 47

Total.....	58,475 01
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### ORIGINAL COST OF LINE, EQUIPMENT, Etc.

#### LINE CONSTRUCTED BY COMPANY.

Total expenditures by company for construction.....	\$195,805 20
Total expended for construction and purchase.....	195,805 20

## STOCK AND DEBT.

## CAPITAL STOCK.

Amount authorized—common.....	\$100,000 00	
Amount subscribed.....	100,000 00	
Amount issued.....	100,000 00	
Par value of shares .....	\$50 00	
Amount paid in—general.....	100,000 00	
Total paid in capital stock.....		\$100,000 00

## OTHER INDEBTEDNESS.

Contracted for construction, equipment or real estate.....	\$53,000 00	
Net unfunded debt.....		\$53,000 00
Decrease since June 1, 1880.....	\$15,500 00	

## EARNINGS, OPERATING EXPENSES, Etc., FOR YEAR ENDING JUNE 1st.

## EARNINGS.

Total earnings of line operated included in this report.....	\$125,334 04
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## OPERATING EXPENSES.

Maintenance of way, poles, wire, etc.....	\$20,756 98	
Taxes—Ohio.....	924 51	
Legal expenses.....	\$2,172 65 }	2,472 65
Interest and insurance.....	300 00 }	
Office salaries, operators' wages, etc. ....	41,404 22	
Other general expenses of operating.....	7,750 60	
Instrument rentals.....	25,955 00	
		\$99,263 96
Net income over operating expenses and rents paid.....		26,070 08
Percentage of to total means applied to construction, etc....	19,580 50	

No allowance made for renewals and depreciation of lines for the year, estimated at 10 per cent of cost.

## OFFICERS.

Directors—A. D. Bullock .....	Cincinnati.
A. Eckenbrecher ..	"
C. H. Kilgour .....	"
John Kilgour.....	"
George N. Stone .....	"
C. B. Gove.....	"
C. T. Dickson .....	"

President, A. D. Bullock.

Vice-President, John Kilgour.

Secretary, Chas. T. Dickson.

Treasurer, Chas. H. Kilgour.

General Superintendent, Wm. H. Eckert.

*State of Ohio, County of Hamilton, ss.:*

Personally appeared before me, a Notary Public in and for said county, W. H. Eckert, General Manager of the City and Suburban Telegraph Association, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last. are true and correct, as he verily believes.

W. H. ECKERT,

*General Manager.*

Subscribed and sworn to before me, at Cincinnati, this 8th day of May,  
A. D. 1882.

ALFRED G. COFFEEN,

*Notary Public, Hamilton County, Ohio.*

## CONNOTTON VALLEY TELEGRAPH COMPANY.

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Location of principal office of the company: Canton, Ohio.  
 Principal office in Ohio at Canton, Ohio.  
 Address correspondence relating to this report to A. B. Proal.  
 Date of incorporation: No incorporation—see below.

### CHANGES SINCE ORIGINAL INCORPORATION UP TO JUNE 1st, 1881.

NOTE.—This telegraph line was constructed and is owned by C. G. Patterson, principal conductor of the Connotton Valley Railway. It was built for his own use in the construction of the railroad, he expecting to transfer it at some future date to the railway company, or to some regularly organized telegraph company. The title still remains in him, he using it under the name style C. V. T. Co. It is used for railway business, and only to a very limited extent by the general public, as a matter of accommodation.

### PROPOSED BRANCHES AND EXTENSIONS.

From Mogadore via Bedford to Cleveland, 40.4 miles.

### CHARACTERISTICS OF THE LINE.

Single Main Line.	Entire Line.	In Ohio.
Dell Roy to Mogadore.....	60.2	60.2
Length of wire—entire line—galvanized.....		60.2
Length within the State of Ohio—galvanized.....		60.2
Increase within the year ending June 1st.....		19
Number of poles to the mile.....		264
Number of stations—entire line.....	10; in Ohio, 10	
Number of persons employed in operating and maintaining the line—entire line.....	10; in Ohio, 10	
Number of miles of wire used jointly with railroad companies in Ohio in connection with work in construction.		

### ORIGINAL COST OF LINE, EQUIPMENT, Etc.

#### LINE CONSTRUCTED BY CONTRACTOR.

Contingent expenses .....	\$3,341 95
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### STOCK AND DEBT.

See note on second page.

EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 1st

EARNINGS.

Transmission of messages ..... \$603 88

OPERATING EXPENSES.

None; as operating is done by employes of contractor in addition to other duties.

OFFICERS.

Directors—A. B. Proal ..... Canton, Ohio.  
President—A. B. Proal, acting as manager for C. G. Patterson, contractor, during the construction of the road.

*State of Ohio, County of Stark, ss.:*

Personally appeared before me, a Notary Public in and for said county, A. B. Proal, of the Connotton Valley Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes.

Subscribed and sworn to before me, at Canton, Ohio, this 11th day of October, A.D. 1881.

A. B. PROAL.  
AUSTIN LYNCH,  
*Notary Public.*

# KINGSVILLE MAGNETIC TELEGRAPH COMPANY.

Principal office in Ohio at Kingsville, Ashfabula county, Ohio.

Address correspondence relating to this report to J. H. Kinnear, Secretary, at Kingsville, Ohio.

Date of incorporation: August 7, 1877.

Under laws of what State or States: Ohio.

Incorporated under general or special law: General.

## PROPOSED BRANCHES AND EXTENSIONS.

From Kingsville via Kellogsville, 4 miles.

## CHARACTERISTICS OF THE LINE.

Single main line.	Entire line.
Kingsville, O., to Kellogsville .....	1 mile and 177 rods.
Length of wire—entire line—galvanized, 1 mile and 177 rods.	
Length within the State of Ohio—galvanized, $1\frac{1}{2}$ miles.	
Number of poles to the mile, 27.	
Number of stations—entire line, 2.	
Number of persons employed in operating and maintaining the line—entire line, 1.	

## ORIGINAL COST OF LINE, EQUIPMENT, ETC.

### LINE CONSTRUCTED BY COMPANY.

Posts .....	\$55 00
Wire .....	27 50
Instruments.....	22 00
Office fixtures and other materials used.....	45 50
Total expenditures by company for construction.....	\$150 00
Average cost per mile of line constructed.....	96 54
Proportion of same for Ohio, all.	

## STOCK AND DEBT.

### CAPITAL STOCK.

Amount subscribed—general .....	\$150 00
Amount subscribed, all.	
Amount issued, all.	
Par value of shares, \$5.00.	
Amount paid in—general .....	150 00
Total paid in capital stock.....	\$150 00



Proportion of same for Ohio ( $1\frac{17}{26}$  miles), all.

Stockholders, residents of Ohio, 30.

Amount of stock held by them June 1, 1881, \$150.

Agents authorized to transfer stock: The offices at Kingsville, Ohio.

Number of shares transferred within the year at such agencies, 4.

## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 1st.

### EARNINGS.

Transmission of messages .....	\$68 37
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### OPERATING EXPENSES.

Maintenance of way, poles, wire, etc....	\$20 32
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General expenses:

Taxes—Ohio .....	1 37
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Total operating expenses, being $31\frac{72}{100}$ per cent. of earnings.....	\$21 69
---	---------

Net earnings of $1\frac{17}{26}$ miles operated .....	46 68
---	-------

Net income over operating expenses and rents paid.....	46 68
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Percentage of same to capital stock and debt,  $27\frac{7}{10}$ .

Per mile of earnings, \$43.84; proportion for Ohio, all.

operating expenses, \$13.95.

net earnings, \$29.89.

## CONDENSED GENERAL BALANCE SHEET, JUNE 1st, 1881.

### LIABILITIES.

Capital stock .....	\$150 00
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Cash on hand June 1, 1880.....	23 60
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Receipts for commission of messages .....	68 37
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	\$241 97
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### ASSETS.

Line and fixtures.....	\$150 00
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Operating expenses.....	21 69
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Dividends paid.....	29 00
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Cash on hand June 1, 1880.....	41 28
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	\$241 97
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### OFFICERS.

Directors—E. M. Curtess.....	Kingsville, Ohio.
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E. F. Brown.....	Kingsville, Ohio.
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W. A. Brewer .....	North Kingsville.
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President—M. W. Wright.

Secretary—J. H. Kinnear.

Treasurer—A. B. Luce.

General Superintendent—The Directors.

*State of Ohio, County of Ashtabula, ss.:*

Personally appeared before me, a Notary Public in and for said county, J. H. Kinnear, Secretary of the Kingsville Magnetic Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes.

J. H. KINNEAR.

Subscribed and sworn to before me, at Kingsville, this 17th day of September, A. D. 1881.

M. W. WRIGHT,  
*Notary Public.*

## McCONNELLSVILLE AND ZANESVILLE TELEGRAPH.

Location of the principal office of company: McConnellsville, Ohio.

Address correspondence relating to this report to S. Brownell, McConnellsville.

### CHANGES SINCE ORIGINAL INCORPORATION UP TO JUNE 1, 1881.

This line is owned and operated by myself. I keep no accurate account of receipts or expenses. There are twenty-eight miles of line, with three offices—McConnellsville, Zanesville and Gaysport. The receipts were from \$800 to \$900 per year; expenses, probably \$200 per year. Tariff from here to Zanesville, 35 and 2; from Gaysport to McConnellsville and Zanesville, 25 and 2 each.

Total single main line, 28 miles.

Number of poles to the mile, 30.

Number of stations—entire line, 3.

Original cost of line, equipment, etc., \$500.

### OFFICERS.

S. Brownell, owner, McConnellsville, Morgan county, Ohio.

*State of Ohio, County of Morgan, ss.:*

Personally appeared before me, a Notary Public in and for said county, S. Brownell, owner of the McConnellsville and Zanesville Telegraph, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes.

S. BROWNELL.

Subscribed and sworn to before me, at McConnellsville, this 24th day of May, A. D. 1882.

EUGENE J. BROWN,  
*Notary Public.*

## PUT-IN-BAY TELEGRAPH COMPANY.

Location of principal office of the company: Sandusky, Ohio.

Principal office in Ohio at Sandusky, Ohio.

Address correspondence relating to this report to G. W. Dane, at Sandusky, Ohio.

Date of incorporation: 1873.

Under laws of what State or States: Ohio.

### CHARACTERISTICS OF THE LINE.

Sandusky to Gypsum—poles.....	8
Gypsum to Mouse Island—pds. wire.....	1442
Mouse Island to Put-in-Bay—cable.....	3½
Cable Landing to office .....	1
Length of submarine cables—in Ohio.....	3½
Length of wire—entire line—plain galvanized.....	19½

Total .....	23
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Length within the State of Ohio, 23.

Number of poles to the mile, 25.

Number of stations—entire line—in Ohio, 2.

Number of persons employed in operating and maintaining line—entire line, commission.

### STOCK AND DEBT.

#### CAPITAL STOCK.

Amount authorized—general.....	\$14,000 00
Amount subscribed.....	6,550 00
Amount issued—stock dividend, \$3,200.....	9,850 00
Par value of shares.....	\$50
Amount paid in—general.....	6,650 00
Total paid in capital stock.....	6,650 00
Average amount paid in per mile (23 miles).....	27 26

Stockholders, residents of Ohio, 17.

Amount of stock held by them June 1, 1881, 153.

Agents authorized to transfer stock: Mrs. A. C. McMeens, Sandusky, Ohio.

#### FUNDED DEBT.

Decrease since June 1, 1880.....	\$250 00
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### EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 1.

#### EARNINGS.

Transmission of messages.....	\$568 98
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## OPERATING EXPENSES.

General expenses, as follows:

Taxes—Ohio.....	\$18 80
Salaries, commission.	

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Dividends, \$1 per share.

Last dividend declared on general stock, May, 1881.

Floating debt liquidated—cash, \$250.

## OFFICERS.

Directors—Mrs. A. C. McMeens.....	Sandusky.
Geo. W. Dane.....	"
H. O. Stafford .....	"
Geo. A. Merot.....	"
H. J. Donahoo.....	"
C. I. Idler .....	Put-in-Bay.
E. Huntington.....	Kelly's Island.
President, G. W. Dane.....	Sandusky.
Secretary, Mrs. A. C. McMeens.....	"
General Superintendent, H. Stafford .....	"

*State of Ohio, County of Erie, ss. :*

Personally appeared before me, a Notary Public in and for said county, George W. Dane, President of the Put-in-Bay Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes.

GEO. W. DANE, *President.*

Subscribed and sworn to before me at Sandusky, Ohio, this 13th day of October, A. D. 1881.

S. C. WHEELER,  
*Notary Public.*

## TRI-UNION TELEGRAPH COMPANY.

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Location of principal office of the Company: Northfield, Ohio.

Principal office in Ohio at Northfield.

Address correspondence relating to this report to J. G. Alexander, at Northfield, Summit county, Ohio.

Date of incorporation: December 22, 1879.

Under laws of what State or States: Ohio.

Incorporated under general or special law: General.

### CHANGES SINCE ORIGINAL INCORPORATION UP TO JUNE 1st, 1881.

We consolidated with, or bought out, the Ohio Telegraph and Telephone Company, from Peninsula, Ohio, to West Richfield, Ohio, with stock; also bought out the Chagrin Falls and Solon Telegraph and Telephone Line. I believe these are all the changes.

### PROPOSED BRANCHES AND EXTENSIONS.

From Northfield, via Brecksville, to Brecksville—5 miles.

### CHARACTERISTICS OF THE LINE.

#### LINES OPERATED.—(MILES OF WIRE.)

Single Main Line.	Entire Line.
Northfield to Chagrin Falls.....	15 miles.
Peninsula to West Richfield .....	6 "
<hr/>	
Total single main line.....	21 miles.
Total length of lines.....	21 "
Length of wire—entire line—galvanized.....	"
Total.....	"
Length within the State of Ohio—galvanized.....	"
Total .....	"
Increase within the year ending June 1st .....	16 miles.
Number of poles to the mile.....	25 to 30.
Number of stations—entire line, 7.	
Number of persons employed in operating and maintaining the line—entire line, 7.	

## EXPENSE AND CONSTRUCTION ACCOUNT.

All expenditures for construction, etc., for the year ending June 1st, 1881 inclusive.	
Poles .....	\$100
Wire .....	85
Instruments.....	125
Other material used .....	50
Rents .....	20
Contingent expenses.....	25
<hr/>	
Total .....	\$480

## ORIGINAL COST OF LINE EQUIPMENT, ETC.

## LINE CONSTRUCTED BY COMPANY.

Posts .....	\$150
Wire.....	125
Instruments.....	125
Office fixtures and other materials used.....	50
Paid for salaries and labor .....	150
Rents paid.....	20
Contingent expenses.....	25

## LINES ACQUIRED BY PURCHASE.

From Solon to Chagrin Falls, O. (original cost, \$250) purchased for.....	\$200 cash.
From Peninsula to West Richfield (original cost \$300) purchased for..	1,200 in stock.
Subsequent expenditures for construction .....	\$25
Total expended for construction and purchase .....	1,425
Average cost per mile of line constructed .....	50 00
Average cost per mile of line owned by company.....	50 00

## STOCK AND DEBT.

## CAPITAL STOCK.

Amount authorized—general.....	\$1,000 00
Increase since June 1, 1880, 75 per cent.....	1,200 00
Amount issued ..	3,825 00
Par value of shares, 5; cash value... ..	\$1 50
Increase since June 1, 1880 .....	1,200 00
Stockholders residents of Ohio.....	13
Amount of stock held by them June 1, 1881 .....	3,825 00

## OTHER INDEBTEDNESS.

All other debts, current credit balances, etc.....	\$200 00
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## EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 1st.

## EARNINGS.

Transmission of messages .....	\$175 00
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## OPERATING EXPENSES.

General expenses of operating.....	52 62
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## CONDENSED GENERAL BALANCE SHEET, JUNE 1, 1881.

## LIABILITIES.

Note for borrowed money.....	\$200 00
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## ASSETS.

Twenty-six miles line, including battery, instruments, etc.....	\$1,300 00
Cash on hand.....	50 00

## OFFICERS.

Directors—J. G. Alexander, T. B. Lemoin, R. S. Hubbard, A. C. Munn, J. Lemoin,  
A. M. Cole, C. Wood.

President—J. G. Alexander.

Vice President—R. S. Hubbard.

Secretary, Treasurer and General Superintendent—T. B. Lemoin.

*State of Ohio, County of Summit, ss.:*

Personally appeared before me, a Justice of the Peace in and for said county, J. G. Alexander, President of the Tri-Union Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes.

J. G. ALEXANDER.

Subscribed and sworn to before me, at Northfield, Ohio, this 27th day of April, A. D. 1882.

WM. L. PALMER, J. P.

Tariff rates, 15 and 1.

## UNION METROPOLITAN TELEGRAPH COMPANY.

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Location of principal office of the company : Cleveland, O.

Address correspondence relating to this report to T. P. Abernethy, Cleveland, O.

Date of incorporation : April 9, 1874.

Under laws of what State or States : Ohio.

Incorporated under general or special law : General.

### CHANGES SINCE ORIGINAL INCORPORATION UP TO JUNE 1, 1881.

See annual report ending June, 1880. No further change.

### CHARACTERISTICS OF THE LINE.

Total length of line, 7 miles.

Length of wire—entire line—galvanized, 7 miles.

Length within the State of Ohio—galvanized, 7 miles.

Number of poles to the mile : Line on housetops and W. U. Company's poles.

Number of stations—entire line, 7 ; in Ohio, 7.

Number of persons employed in operating and maintaining the line—entire line, 12 ;  
in Ohio, 12.

### EXPENSE AND CONSTRUCTION ACCOUNT.

All expenditures for construction, etc., for the year ending June 1, 1881, inclusive :

Wire.....	\$5 00	
Instruments.....	15 00	
Other material used .....	10 00	
Rents .....	60 00	
Salaries paid.....	960 00	
Deficit Superintendent's salary since last report .....	115 68	
Expenses not included in the above—repairing, etc.....	180 00	
Total .....		\$1,345 68

### ORIGINAL COST OF LINE, EQUIPMENT, ETC.

The total cost, as near as I can ascertain, was about \$500.

### EARNINGS, OPERATING EXPENSES, ETC., FOR YEAR ENDING JUNE 1.

#### EARNINGS.

Transmission of messages.....	\$1,353 41
Total earnings of line operated included in this report .....	1,353 41



## OPERATING EXPENSES.

## General expenses :

Taxes—Ohio .....	\$210 00	
Salaries—deficit last report .....	960 00	
Other general expenses of operating .....	115 68	
		<hr/>
		1,285 68
Rentals paid .....	\$60 00	
		<hr/>
Net income over operating expenses and rents paid .....		\$7 73
Per mile of operating expenses .....		\$1,345 68
net earnings .....		1,353 41

## CONDENSED GENERAL BALANCE SHEET, JUNE 1st, 1881.

## ASSETS.

Seven miles wire insulators, instruments, batteries, office fixtures, repairing tools, and office stationery .....	\$300 00
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## OFFICERS.

General Superintendent, J. P. Abernethy.

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*State of Ohio, County of Cuyahoga, ss.:*

Personally appeared before me, a Notary Public in and for said county, J. P. Abernethy, of the Union Metropolitan Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes.

J. P. ABERNETHY.

Subscribed and sworn to before me, at Cleveland, Ohio, this 8th day of September, A.D. 1881.

J. S. ZOYEN,

*Notary Public.*

Tariff rates—15 cents and 1 our local rate in city.

## WESTERN UNION TELEGRAPH COMPANY.

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Location of principal office of the company: New York City.

Principal office in Ohio at Cincinnati.

Address correspondence relating to this report to Norvin Green, President, at New York City.

Date of incorporation: April 8, 1851.

Under laws of what State or States: New York.

Incorporated under general or special law: General law.

### CHANGES SINCE ORIGINAL INCORPORATION UP TO JUNE 1st, 1881.

The information here desired is impossible to give. No compilation of it exists, and none of the earlier records are complete.

In the month of January, 1881, this company purchased all the property, lines, leases, contracts and franchises of the American Union Telegraph Company, and also of the Atlantic and Pacific Telegraph Company.

### PROPOSED BRANCHES AND EXTENSIONS.

Too numerous to mention.

### CHARACTERISTICS OF THE LINE.

•Unable to give this, because of the conditions of the two companies, which were purchased in January, 1881.

### STOCK AND DEBT.

#### CAPITAL STOCK.

Amount authorized—general.....	\$80,000,000
Amount issued .....	80,000,000
Par value of shares.....	100
Agents authorized to transfer stock: Union Trust Company, New York.	
Number of shares transferred within the year at such agencies: Have no records.	

## FUNDED DEBT.

Six per cent. bonds, due March 1, 1900.....	\$951,102 00
Seven per cent. bonds, due May 1, 1900.....	3,920,000 00
Seven per cent. bonds, due May 1, 1902.....	1,373,000 00
Total funded debt.....	\$6,244,102
Amount in hands of trustees of sinking fund for redemption..	\$190,855 18

## OTHER RECEIPTS AND PAYMENTS WITHIN THE YEAR.

## RECEIPTS OTHER THAN EARNINGS.

Income on sinking fund investment.....	\$4,767 92
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## PAYMENTS OTHER THAN OPERATING EXPENSES AND RENTALS.

Interest on bonds (net).....	\$427,455 51
Dividends, rate six per cent. on general stock.	
Last dividend declared on general stock, June 14, 1881.	
Applied to sinking fund.....	40,005 35
	<hr/> \$467,460 86

## CONDENSED GENERAL BALANCE SHEET, JUNE 1, 1881.

## LIABILITIES.

Telegraph lines, franchises, contracts, patents, etc.....	\$80,665,351 63
Real estate.....	2,800,384 93
Gold and stock Tel. Co.'s stock.....	1,909,411 87
International Ocean Telegraph Co.'s stock.....	1,367,733 29
Sundry other stocks and bonds.....	318,881 67
Supplies in supply department.....	213,003 75
Cash on hand....	1,670,446 75
Due from agents of the company.....	546,866 40
"    United States.....	34,247 48
"    other Tel. Co.'s.....	204,605 36
"    loan on calls.....	6,898 91
"    sundry suspense accounts.....	173,762 77
Sinking fund balances in hands of trustees.....	190,855 19
Sundry accounts collectible.....	56,127 60
	<hr/>
Total liabilities.....	\$90,199,059 19

## ASSETS.

Capital stock.....	\$80,000,000 00
Funded debt.....	6,244,102 00
Due to other Tel. Companies.....	235,802 44
"    for rentals of leased lines.....	115,828 33
"    "    supplies purchased (in May).....	35,071 16

Due to sundry individuals, etc.....	102,016 09	
“ for dividends .....	54,389 86	
“ on sundry line subscriptions.....	6,877 54	
“ for interest part due.....	4,329 50	
“ to Press Associations.....	4,521 38	
Surplus of income accounts.....	3,396,120 89	
		<hr/>
Total assets.....		\$90,199,059 19

OFFICERS.

Directors—Norvin Green.....	New York City.
Thomas T. Eckert.....	“
Edwin D. Morgan.....	“
John Van Horne.....	“
Augustus Schell.....	“
Harrison Durkee.....	“
Jay Gould .....	“
Russell Sage .....	“
Alonzo B. Cornell .....	“
Sidney Dillon.....	“
Cyrus W. Field .....	“
Edward S. Sanford.....	“
James H. Banker.....	“
Moses Taylor .....	“
Robert Lenox Kennedy .....	“
Hugh J. Jewett.....	“
J. Pierpont Morgan .....	“
Frederick L. Ames.....	“
Edwin D. Worcester .....	“
William D. Bishop.....	“
C. P. Huntington.....	“
George B. Roberts .....	“
Zalmon G. Simmons.....	“
Samuel Sloan.....	“
Erastus Wiman .....	“
Amasa Stone.....	“
George J. Gould.....	“
Chauncey M. DePew.....	“
James W. Clendaim.....	“

President, Norvin Green.

Vice-Presidents, Augustus Schell, Thomas T. Eckert, Harrison Durkee, John Van Horne.

Secretary, A. R. Brewer.

Treasurer, R. H. Rochester.

General Manager, Thomas T. Eckert.

Attorney, Clarence Cary.

*State of New York, City and County of New York, ss.:*

Personally appeared before me, a Notary Public in and for said county, R. H. Rochester, Treasurer of the Western Union Telegraph Company, who, being duly sworn, deposes and says that the foregoing statements of the affairs of said company on the 1st day of June last, are true and correct, as he verily believes, according to the best of his knowledge and information.

R. H. ROCHESTER.

Subscribed and sworn to before me, at New York, this 22d day of June, A. D. 1882.

WILLIAM ARNOUX,

*Notary Public, Kings and New York Counties.*

## APPENDIX.

## STRENGTH OF WROUGHT-IRON BRIDGE MEMBERS.

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In estimating the strength of some of the railway bridges of the State, it became necessary to employ formulas not to be secured in printed form.

The results of the investigations by which the formulas were derived are embraced in the following essay, by Prof. S. W. Robinson, of the Ohio State University, and one of the railroad inspectors.

By request, this dissertation was permitted to be printed in Van Nostrand's Engineering Magazine, vol. 26, May and June, 1882, pp. 409-487. It has since been republished in No. 60 of Van Nostrand's "Science Series" of engineering hand-books.

COMMISSIONER RAILROADS AND TELEGRAPHS.

# STRENGTH OF WROUGHT-IRON BRIDGE MEMBERS.

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PART I.—GENERAL THEORY OF BEAMS.

PART II.—PRACTICAL FORMULAS FOR BEAMS, STRUTS, COLUMNS AND SEMI-COLUMNS.—EXTENDED COMPARISON OF VARIOUS FORMULAS WITH EXPERIMENT.

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By S. W. ROBINSON, C.E.,

Prof. Mech. Engineering, Ohio State University.

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## I.

THE examination of bridges for strength and trustworthiness has occasioned the use of formulas not accessible to the writer in published form. In procuring the formulas by direct solution, the amount of labor entailed has been great. The avoidance of a repetition of this labor on the part of others who may require these formulas, is believed to be sufficient reason for now publishing the results obtained.

To make clear the nature of the formulas required, the conditions to which certain bridge members are subject may be referred to. Thus, in some instances,

the chords of truss bridges are required to carry the floor beams, one, two or more of them, to each panel. Now, when a train of cars comes upon a bridge, the floor-beam loads rest down upon the chord members and deflect them into downward bowing curves, causing "transverse strains," or "bending moments." Simultaneously, the load upon the bridge causes endlong strains in the same chord members; tension for the lower, and compression for the upper chord. Thus, an individual member of the chord of the bridge, such as an "eye bar," is to be treated as a beam subjected



to a combined bending and stretch, or bending and compression, as the case may be.

The usual way of calculating the resulting maximum strain in the piece considered, is to compute as though the beam had only the "cross strain," and then compute separately for the endlong strain, and add the results. It is evident, however, from a casual consideration that as the bending load would separately give a certain curve to the beam, the tension would partially straighten that curve and diminish the bending moment. Again, in a compressive endlong strain, the curvature of the beam would be in-

For the sake of fixing the ideas, let Fig. 1 represent a beam fixed at the end, B, and free at the end, A. Let the cross force,  $P$ , act at right angles to the beam, and the endlong force,  $T$ , in the direction of the length, both being applied at the free end of the beam. The bending will be as shown, the fibers on the upper side of the beam being stretched, and those on the lower side being compressed, if  $T$  is not too great.

Now, undoubtedly one effect of  $T$  is to elongate the whole beam and every part of it, throwing the neutral axis for all the stresses, downward from the line ACB to some line  $C'B'$ , or  $C''B''$ . This dis-

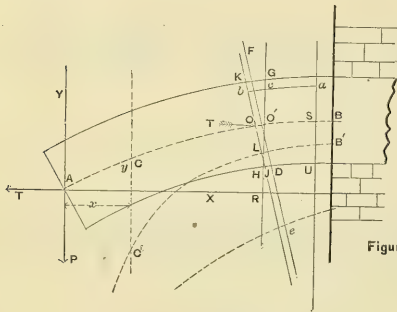
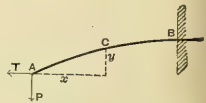


Figure 1



creased and the bending moment increased. Hence, the usual calculation would give too large a value to the maximum strain per square inch in one case, and too small in the other. The formulas given in this article correct these anomalies.

The conditions of the piece just referred to as regards loading and supports are stated in general terms, but it is evident that they include all such special conditions as concentrated loads; distributed loads; one end fixed and the other free; one end fixed and the other supported; both ends supported; both ends fixed, &c.

#### TRUE FLEXURAL MOMENT AND ITS RESISTANCE IN MIXED STRAINS.

Before proceeding to special cases, it is necessary to consider the pseudo-philosophy of eccentric neutral axis in beams subject to both endlong and cross forces.

placement is proportional to  $\frac{T}{Px}$  for the

section at the distance  $x$ , from the free end of the beam. If  $T=0$ , the displacement  $=0$ , anywhere. If  $P=0$ , the displacement is  $\infty$ , anywhere. If  $x=0$ , the displacement  $=\infty$ . If  $x=l$ , and  $P$  very small, the displacement is very great. But for  $T$  and  $P$  moderate, the displacement is moderate. For  $T$  and  $P$  constant and  $x$  variable, the departure of the line of the neutral axis,  $C'B'$  from  $CB$ , increases as  $x$  decreases, and, geometrically speaking, it is asymptotic to the horizontal through  $B$ , and to the vertical, through  $A$ . Though this line is a real neutral axis, as regards stress, it can easily be shown that it is not the most convenient line in which to place the origin of moments, for the well known differential equation of the elastic curve, viz.:

$$\epsilon I \frac{d^2 y}{dx^2} = \Sigma P x = \Sigma (\text{applied moments}),$$

$$= M \quad (1)$$

This equation, as it stands, is an equation of moments of forces, the second member being the sum of the moments of the forces acting on the beam, while the 1st member is the sum of the moments of the internal forces of the beam resisting bending, or, more briefly, the "moment of resistance" of the beam. The origin of moments, or moment axis for this equation, is taken on some certain cross section of the beam, as, for instance, DF, and then the moments of the forces are to be expressed for that particular origin of moments. The equation is then integrated, resulting in the equation of the elastic curve. The effect of the integration is to move the plane, D F, from end to end of beam, thus summing the bending effects due to each element of length of beam.

That the origin of moments for the above equation of moments should be taken on the sectional plane, DF considered, no one doubts; but *where* it should be taken is seriously questioned. Some writers definitely locate it, by saying that the moment of inertia,  $I$ , is here variable, the neutral axis not being parallel to the beam. According to this, if C'B' be the neutral axis, as above described, the origin of moments must be taken at L, in applying the above general equation (1) to Fig. 1. The moment of inertia,  $I$ , of the section, DF, is then to be expressed for the moment of inertia axis at L, coinciding with the origin of moments. Now, to discuss this conclusion, draw G H, DF, and JK, as shown. Let the portion, SO, of the beam be supposed to stretch, displacing DF to JK, this stretch being due to T. Again, let the bending moments displace GH, through an angle to FD, causing a stretch in the upper fibers and a compression in the lower fibers of the beam, the triangles, O'FG and O'HD, representing the two actions respectively. Respecting a fiber,  $ab$ , the stretch from the line, G, to F is due to cross strain, and from F to K, to endlong strain.

Now, for the sake of an argument, let it be granted that the origin of moments for equation (1) be taken on the real

neutral axis, C'B', at L. This point is where the cross section, JK considered, intersects the real neutral axis. That is, L is the point in the section, JK, where there is actually no longitudinal stress. The figure indicates this, since at the top of the beam, GF stands for stretch due to cross strain; FK, the stretch for endlong strain, their sum, GK, being the total stretch or stress. This stress is less and less in going down from the top, until it vanishes at L, where the limiting lines, GL and KL, for the stress named, intersect on the neutral axis, C'B'.

Now, in applying equation (1) to the beam, Fig. 1, with the understanding that the *origin of moments be taken at L*, we have

$$\frac{\epsilon I}{\rho} = \epsilon I \frac{d^2 y}{dx^2} = P \cdot AR - T \cdot RL \quad (2).$$

where the moment of inertia,  $I$ , of the first member, is to be so expressed that its axis coincides in position with the origin of moments, L. Let the beam be regarded as uniform in cross section from end to end, with the line, ACOB traversing the center of gravity of any cross section. Let  $I_1$  represent the moment of inertia of the cross section considered, for an axis located at the center of gravity of that section. For KJ this axis is at O, the point O being the "principal axis" or "center of inertia." Now, a well-known principle in mechanics, by which  $I$  may be obtained from  $I_1$ , gives

$$I = I_1 + \text{section JK} \cdot \overline{LO}^2 \quad (3).$$

Hence the first member of equation (2) is

$$\frac{\epsilon I}{\rho} = \frac{\epsilon I_1}{\rho} + \frac{\epsilon}{\rho} \text{section JK} \cdot \overline{LO}^2$$

$$= \frac{\epsilon I_1}{\rho} + \frac{\epsilon}{\rho} K \cdot \overline{LO}^2 \quad (4).$$

where K is here taken for the cross section JK.

The denominator  $\rho$  is the radius of curvature of the curve of the neutral axis as shown in Fig. 1 at  $e$ .

If S U and G H be taken parallel before flexure and fixed to the beam, SO being regarded as an element of length,  $dx$ , of the beam, then during flexure S U and G H intersect at the center of curvature of the elastic curve, thus deter-

ining  $\rho$ . Then, relative to the fiber S O' O, Fig. 1, we will have the stretch of the fiber = O' O; and from the similarity of triangles we may write

$$OL : \rho :: O'O : SO'.$$

$$\therefore \frac{LO}{\rho} = \frac{O'O}{SO'}.$$

A well-known fundamental formula in the theory of the elastic resistance of beams is

$$T l = \varepsilon K d l \quad . \quad . \quad . \quad (4\frac{1}{2}).$$

where T is a force applied to a bar of length,  $l$ , of section K, and co-efficient of elasticity,  $\varepsilon$ ; for which the stretch is  $dl$ . This formula may be applied to the part S O' of the beam Fig. 1 by making  $l = S O'$  and  $dl = O' O$ , the section, K, being the same whole section, JK. In this, the  $dl$  is = O' O = F K = D J.

Hence

$$T.SO' = \varepsilon K.O'O = \varepsilon K. \frac{LO}{\rho}.SO'$$

or

$$T = \varepsilon K \frac{LO}{\rho}$$

combining this with (4), we get

$$\frac{\varepsilon I}{\rho} = \frac{\varepsilon I_1}{\rho} + T.LO$$

Comparing with equation (2) we have

$$\frac{\varepsilon I}{\rho} = \frac{\varepsilon I_1}{\rho} + T.LO = P.AR - T.RL$$

or

$$\begin{aligned} \frac{\varepsilon I}{\rho} &= P.AR - T.RL - T.LO \\ &= P.AR - T(RL + LO) \end{aligned}$$

or

$$\begin{aligned} \frac{\varepsilon I}{\rho} &= \varepsilon I_1 \frac{d^2 y}{dx^2} = P.AR - T.RO = M \\ &= \Sigma Px - \Sigma Ty \quad . \quad . \quad (5). \end{aligned}$$

This equation has for its first member the ordinary expression for the moment of elastic resistance of beams, subject simply to bending forces applied only at right angles to the beam; that is to say, the expression in which the origin of moments for the resisting forces is at the center of gravity of the cross section of beam considered, or at O, Fig. 1. The second member expresses simply the mo-

ments of the applied forces for the same origin of moments, viz.: the point O.\*

Hence it follows that in cases of flexure of beams, where part of the forces are applied in an endlong or longitudinal direction, the moments may unhesitatingly be expressed with reference to an origin of moments located at the center of gravity of the cross section considered. Equation (5) makes this evident, not only for the moment of resistance but for the entire number of the applied forces. Indeed, a little consideration of M, in equation (5), shows that the above statement respecting the moment of the applied forces is true in general; that is to say, it is true for any number of forces, having any conceivable points of application, and having any conceivable lines of direction. For each force may be resolved into two components, one longitudinal and the other transverse; T.RO being the algebraic sum of the moments of all the former and P.AR of the latter. It is to be understood that in the integrations, proper limits are to be chosen, so that no point of concentration of applied force be overstepped in this, any more than in ordinary problems.

These facts place all problems in the resistance of beams on the same basis, that is to say, equation (5) applies with equal truth and exactness for a beam subject to the action of any system of forces, however complex, as for the simple case of a single transverse force;  $I_1$  being always regarded as the principal moment of inertia and constant for a beam of uniform cross section.

This complete generalization of equations (1) and (5) for a constant value of I is important, since the integrations are not only facilitated, but we are enabled to apply the resulting formulas for a beam under any system of forces, with the same degree of confidence as for the most simple case.

To confirm the facts above stated by discussion, let us refer to Fig. 1. First,

\* In the above transformation the radius of curvature  $\rho$  has been all the time regarded as of the same value. Fig. 1 shows that this is correct. For in  $\frac{\varepsilon I}{\rho}$  it extends from L to the center of curvature, or to where LJ produced meets SU produced. In  $\frac{\varepsilon I_1}{\rho}$  it extends from O' to where O'D intersects SU produced. But as LJ and O'D are parallel to each other the radii of curvature have the same value.

suppose P applied, bending the beam downward as shown. Then apply T as shown. This latter will evidently partially straighten the curvature, and raise the end of the beam. But it will finally come to rest under some degree of curvature, P and T both acting. The portion S O' of the beam will stretch, D F moving to J K. Next apply an equal and opposite endlong force—T, at the center of gravity O, of the cross-section J K. This latter will have no tendency whatever to bend the portion S O, but it will exactly return J K to D F. In this the end of the beam will not be raised or lowered, the deflection being entirely due to the two forces acting at the end of the beam. The stress in the beam is now simply that represented by the triangles O' G F and O' D H. The moment of resistance is  $\frac{\epsilon I}{\rho}$  axis for I, be-

ing at O', and the moment of P will be P.A.R. But as to T we have a couple between T at the line AR and—T at O' the arm of the couple being RO. Hence the moment of this couple is T.R.O'. All these moments are seen to have the origin of moments at the point O, or O' both being practically the same point. This re-establishes equation (5).

So far, the endlong force, when spoken of in connection with Fig. 1, has been treated as producing tension. But it is easily seen that similar reasoning follows for T, so taken as to compress the beam. Indeed, the algebraic sum, T.O.R, mentioned above, contemplated positive as well as negative forces.

Equation (5) enables us to find the equation of the elastic curve of the bent beam. Having the equation of the curve, we can readily find the deflection at any point. Also the moment of strain M, may be found as soon as the unknown constants of integration are determined.

#### TRUE MAXIMUM STRAIN IN ANY CROSS SECTION.

By aid of the moment M and the endlong force T, we may find the maximum strain produced in any cross section of the beam, as for instance in the section at O, Fig. 1. At the top of the beam, the strain is GK, and at the bottom it is JH; GK being the greater, it is the one sought.

The strain GK is the sum of two parts, GF and FK, the former being due to the moment M of bending, and the latter to the direct tension T. To find the total amount of this strain per square inch, we may apply the well known formula for the strength of beams for finding the part GF thus

$$\frac{t_1 I_1}{d_1} = M, \quad \dots \quad (6).$$

where M is given by equation (5), as the algebraic sum of the moments of all the applied forces, the center of gravity of the section considered being the origin of moments, I, the *principal* moment of inertia for the same section, as previously stated,  $d_1$  the distance from the center of gravity of the section to that point where the strain is greatest, and  $t_1$  is the strain due to the moment M. In Fig. 1 O' is the center of gravity of the section DF considered, I, is the moment of inertia of that section for O' the axis, and  $d_1$  is O'F. As a formula for determining the moment of ultimate resistance of beams,  $t_1$  is to be assumed equal the ultimate resistance or modulus of resistance to rupture. Equation (6) is the converse of this, where M is predetermined and  $t_1$  found as a stress considerably below the ultimate value. In calculating the ultimate strength of beams, formula (6) is known to give values wide of the truth. This is due to the fact that the law of resistance in the neighborhood of rupture deviates greatly from the law of perfect elasticity. But within the elastic limits, as will usually be the case with (6), the formula, as is well known, will be truthful. The strain FK Fig. 1, as above explained is due to T, and if the intensity be represented by  $t_2$  and the sectional area DF by K, we will evidently have

$$t_2 K = T \quad \dots \quad (7)$$

Let  $t_3 = GK$ , Fig. 1, stand for the whole maximum strain per square inch in the section considered.

Then

$$t = t_1 + t_2 = \frac{M d_1}{I_1} + \frac{T}{K} \quad \dots \quad (8).$$

a perfectly general formula, free from all assumed approximations except in the instance where  $\rho$  is placed equal the



second differential co-efficient. This, however, is done by all writers on beams. But it is known that the error in this assumption is of no practical import whatever in beams as ordinarily used. It is zero where the bent beam is not inclined to the axis  $x$ , and for an inclination of  $10^\circ$  it is less than 5 per cent.

It is to be observed that for rupturing strains  $d_1$  is to be taken as the distance from the center of gravity of the section to the point where the rupture takes place, whether it be by tension or compression.

When the beam is rectangular in cross section with a breadth  $b$  and depth  $d$ , we have

$$d_1 = \frac{d}{2}, I_1 = \frac{bd^3}{12}, \text{ and } K = bd_1,$$

and also equation (8) agree in making  $t_1 = 0$  and hence, for minimum strains,

$$M = 0, \text{ and } t_1 = 0.$$

To illustrate further, take an "eye bar" of a lower chord of any bridge. Let ABCD represent the loads due to floor beams. The section at the middle of the length will receive the greatest moment of strain due to ABC, &c., while the tension T is uniform throughout. Now, that  $t_1 = 0$ , the centers of the eyes must be raised a distance  $ab$ , shown at the middle section, so that for the maximum bridge load,

$$T.ab = \left\{ \begin{array}{l} \text{sum of the moments of AB and} \\ \text{P, with respect to } a \end{array} \right. \dots (10).$$

When this condition is exactly satisfied, the middle part of the beam near

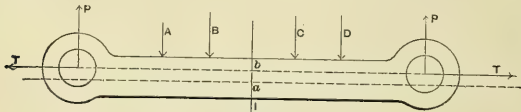


Figure 2.

and hence (8) becomes,

$$t = \frac{6M}{bd^2} + \frac{T}{bd} \dots (9).$$

Here  $d_1$  disappears, as indeed it will in all cases where the cross section of the beam is symmetrical with respect to an axis to that section taken horizontal through O' Fig. 1.

#### NEUTRALIZING OF MOMENTS DUE TO CROSS STRAINS.

It is often desirable to so assume the point of application of T, as to place the beam under the least possible maximum stress when the structure containing the the beam receives its maximum load. For instance, suppose the lower chord of a bridge carries the floor beams, several to each panel. Then it is evident that T may be applied at such point as to make its moment, with respect to the section of beam in question, equal and opposite to the moment of P. This makes  $M = 0$ , and consequently  $t_1 = 0$ . This is evidently the best condition, since  $t_2$  and T are sole and mutual dependencies, and, at best, the minimum strain can never fall below  $t_2$ . This,

JK will be simply stretched and not sprung into curvature. But if the body of the bar be straight when free from strain, it will, when under the condition, (10) be sprung at points near the eyes. The problem then becomes complex because  $ab$  varies with the spring, and would require to be determined with due regard to the amount of flexure, as subsequently done in this article.

But it is possible to so curve the bar in the manufacture, that any part of it will be simply stretched when bearing its maximum load. To indicate a few of the simpler forms, suppose only a single floor beam at the middle of the bar at K. Then the center line of the bar should be a straight line from  $a$ , Fig. 2, each way, to the centers of the eyes, the distance  $ab$  being formed by (10). If there were two floor beams on the link, say A and D only, then the link should be straight between A and D, and also between these points and the centers of the eyes, the lines from point to point being constantly at mid-depth of the body of the bar. If the floor beams were so numerous as to be treated as constituting a uniformly distributed load, the curve of

the center line of the body of the link would be a parabola running from center to center of eyes, with vertex at  $a$ , and with the principal axis vertical. Equation (10) would still determine  $ab$ , the 2d member being regarded as the sum of the movements of all forces except T. For this case the equation would take the form,

$$T.ab = P\frac{l}{2} - \frac{wl^2}{8} \text{ for the middle point,}$$

and (11).

$$Ty = Px - \frac{wx^2}{2} \text{ for any point,}$$

the origin of co-ordinates being at the middle of one eye, with  $l$  the length of the bar, and  $w$  the loading per unit length.

In cases where the cross section of the beam is non-symmetrical, as often the case in upper chords of bridges, the center of gravity of that section is to be found and then  $ab$  laid off, downward in the upper chord and upward in the lower chord.

When chord members are very long, the moment due to their own weight should be found and  $ab$  determined by (11).

#### GENERAL INTEGRALS FOR SOLVING CASES OF MIXED STRAINS.

In the designing of new structures the precautions pointed out above relative to maximum stresses in mixed strains may be provided for in the simplest way, viz: by computing separately and adding, though this may not always be preferable. When this approximate method is not desirable, and in cases where existing structures are to be examined, it may become necessary to make a careful determination of the moment M. To meet this requirement the various cases following have been worked out.

Before taking up the special cases an examination of the expressions for the moments of applied forces, shows that the integrations all come under two general forms, and it will be seen to be decidedly preferable to perform the two integrations once for all than to integrate for each special case.

The first general form is

$$\frac{d^2y}{dx^2} = Ay + Bx + Dx^2 + F. \quad (12).$$

Differentiate twice, and

$$\frac{d^4y}{dx^4} = A \frac{d^2y}{dx^2} + 2D.$$

Now put

$$\frac{d^2y}{dx^2} = n,$$

and differentiate twice,

$$\frac{d^4y}{dx^4} = \frac{d^2n}{dx^2} = A \frac{d^2y}{dx^2} + 2D$$

or

$$\frac{d^2n}{dx^2} = An + 2D$$

multiply through by  $dn$ , and integrate, and we get

$$\frac{dn^2}{dx^2} = An^2 + 4Dn + C$$

or

$$dx = \frac{dn}{\sqrt{A} \sqrt{n^2 + \frac{4Dn}{A} + \frac{C}{A}}}$$

whence, by integration

$$x = \frac{1}{\sqrt{A}} \text{hyp. log} \frac{\frac{2D}{A} + n + \sqrt{n^2 + \frac{4Dn}{A} + \frac{C}{A}}}{C_1}$$

Passing to exponentials and transposing in part,

$$C_1 e^{x\sqrt{A}} - \frac{2D}{A} - n = \sqrt{n^2 + \frac{4Dn}{A} + \frac{C}{A}}$$

By squaring both members and cancelling

$$C_1^2 e^{2x\sqrt{A}} - \frac{4D}{A} C_1 e^{x\sqrt{A}} - 2C_1 n e^{x\sqrt{A}} + \frac{4D^2}{A^2} = \frac{C}{A}$$

solving for  $n$  we obtain

$$\left. \begin{aligned} n = \frac{C_1}{2} e^{x\sqrt{A}} - \frac{C}{2C_1 A} e^{-x\sqrt{A}} \\ - \frac{2D}{A} + \frac{2D^2}{C_1 A^2} e^{-x\sqrt{A}} \end{aligned} \right\} \quad (13)$$

$$= \frac{d^2y}{dx^2} = Ay + Bx + Dx^2 + F$$

The second general form is

$$\frac{d^2y}{dx^2} = -Ay - Bx - Dx^2 - F \quad (14).$$

Differentiate twice and

$$\frac{d^3y}{dx^3} = -A \frac{d^2y}{dx^2} - 2D$$

Put

$$\frac{d^2y}{dx^2} = +n$$

and differentiate twice

$$\frac{d^3y}{dx^3} = \frac{d^2n}{dx^2} = -A \frac{d^2y}{dx^2} - 2D$$

or

$$\frac{d^2n}{dx^2} = -An - 2D$$

Multiply through by  $dn$  and integrate and

$$\frac{dn^2}{dx^2} = -An^2 - 4Dn + C'$$

or

$$dx = \frac{dn}{\sqrt{C' - 4Dn - An^2}}$$

But

$$\int \frac{dz}{\sqrt{a \pm bz - cz^2}} = \frac{1}{\sqrt{c}} \sin^{-1} \frac{2cz \mp b}{\sqrt{4ac + b^2}}$$

where  $a = C'$ ,  $b = 4D$ ,  $c = A$ ,  $z = n$ .

Hence

$$x = \frac{1}{\sqrt{A}} \sin^{-1} \frac{2An + 4D}{\sqrt{4AC' + 16D^2}} - C',$$

or

$$\sin(x\sqrt{A} + C_1') = \frac{An + 2D}{\sqrt{AC' + 4D^2}}$$

Solving for  $n$ , we obtain

$$\left. \begin{aligned} n &= \frac{\sqrt{AC' + 4D^2}}{A} \sin(x\sqrt{A} + C_1') \\ -\frac{2D}{A} &= \frac{d^2y}{dx^2} = -Ay - Bx - Dx^2 - F \end{aligned} \right\} (15).$$

In the application of (13) and (15) to the following cases, it is only necessary to cut out any redundant term, and determine the constants of integration.

#### SOME OF THE PRINCIPAL CASES UNDER MIXED STRAINS.

I. For the first case let the beam be fixed at one end, free at the other, and having a load  $P$  and pull  $T$  applied at the free end.

Fig. 1 or 1a represents it. The first question arising is whether to apply (13) or (15). An inquiry will reveal the fact that the sign of  $Ty$  determines which. The calculus demands that the

ordinate and second differential coefficient have contrary signs when the curve is concave toward the axis of  $x$ . Hence in Fig. 1 they are contrary. Taking  $T$  positive when it is directed toward the beam, and negative when from it, we

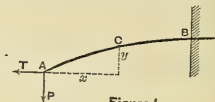


Figure 1a

will have, for  $T$  pointing outward as in Fig 1 or 1a.

$$-\epsilon I_1 \frac{d^2y}{dx^2} = Px - Ty = M$$

$T$  being negative makes the sign of  $\frac{d^2y}{dx^2}$  and  $Ty$  alike.

For convenience let the subscript to  $I$  be dropped in the following equations,  $I$  being always regarded as the principal moment of inertia of the cross section of the beam. Then we have for the origin of moments at  $C$ , Fig. 1a, and of coordinates at  $A$ ,

$$\epsilon I \frac{d^2y}{dx^2} = Ty - Px = M \dots (16).$$

To integrate this equation, we require (13) because the signs of  $Ty$  and  $Ay$  are alike, also of the second differential coefficients.

Comparing with (13)

$$A = \frac{T}{\epsilon I} \quad B = -\frac{P}{\epsilon I} \quad D = 0 \quad F = 0$$

Hence

$$\frac{d^2y}{dx^2} = Ay + Bx = \frac{C_1}{2} e^{nx} - \frac{C}{2C_1 A} e^{-nx}$$

where for convenience  $n = \sqrt{A} = \sqrt{\frac{T}{\epsilon I}}$

$n$  here differing from the  $n$  used in the integrations for (13) and (15).

The above equation for this case is given in *Strength of Materials*, by De Volson Wood, p. 300, 2d ed.

Let the length of the beam be  $l$ , and the distance of the point of application of  $T$  below the center of gravity of the end of the beam be  $h$ . Then if  $x = 0$   $y = h$ , and

$$Ah = \frac{C_1}{2} - \frac{C}{2C_1A}$$

$$\frac{C}{2C_1A} = \frac{C_1}{2} - Ah$$

and

$$Ay + Bx = \frac{C_1}{2} \left( e^{nx} - e^{-nx} \right) + Ahe^{-nx}$$

$$A \frac{dy}{dx} + B = \frac{C_1}{2} \left( e^{nx} + e^{-nx} \right) - Ahne^{-nx}$$

But

$$\frac{dy}{dx} = 0 \text{ for } x=l \text{ and}$$

$$B = \frac{C_1}{2} n \left( e^{nl} + e^{-nl} \right) - Ahne^{-nl}$$

The value of  $C_1$  from this, introduced above, gives

$$Ay + Bx = \frac{\frac{B}{n} + Ahe^{-nl}}{\frac{nl}{e} + e} \left( e^{nx} - e^{-nx} \right) + Ahe^{-nx}$$

Restoring the values of  $A$  and  $B$ , we get

$$Ty - Px = - \left( \frac{P - T}{n} - The \right) \frac{e^{nx} - e^{-nx}}{\frac{nl}{e} + e} + The^{-nx} \\ = M \dots \dots (17).$$

This equation expresses the relation between  $x$  and  $y$  for the equation of the curve of the axis of the beam, that is to say, of the curve AOB, Fig. 1 or 1a. The maximum deflection of the beam is  $y_1 - h$  for  $x=l$ .

Also (17) is so arranged as to give the moment of the applied forces for any point, the first member being the same as (16).

If  $x=0$   $y=h$  as it should.

The maximum moment of strain for the whole beam is evidently at the fixed end where  $x=l$  and  $y=y_1$ . Hence, by reduction,

$$Ty_1 - Pl = - \frac{\frac{P}{n} \left( e^{nl} - e^{-nl} \right) - 2Th}{\frac{nl}{e} + e} \\ = M_{\max} \dots \dots (18).$$

When  $h=0$ ,

$$Ty_1 - Pl = - \frac{P}{n} \left\{ \frac{e^{nl} - e^{-nl}}{\frac{nl}{e} + e} \right\} = M_{\max} \dots (19).$$

with  $h$  restored and  $P=0$

$$Ty_1 = \frac{2Th}{e^{nl} + e^{-nl}} \dots \dots (20).$$

Evidently the resultant of  $T$  and  $P$  might be substituted, and be considered as a single force acting obliquely. Conversely any single force acting obliquely at the end of the beam could be resolved into components corresponding with  $T$  and  $P$ .

If we imagine this resultant acting at the end of  $h$ , its prolongation would intersect the beam when  $h$  is downward. This point of intersection would evidently be a point of contrary flexure at which the moment would be zero. The point could be found by placing the 2d member of (17) = 0 and solving for  $x$ . This point would be a neutral point for an S shaped curve,

II. Let the conditions be as in I, except change  $T$  to a push.

This would seem to be met by changing the sign of  $T$ , but this makes all the expressions in case I imaginary. But it may be rationalized as done in Prof. Wood's *Strength of Materials*, p. 301, 2d ed. But if we change the sign of  $P$  instead of  $T$ , the relation of signs of  $T$  and  $P$  is right. In applying equation (19) with sign of  $P$  changed, we will obtain a negative result for  $y$ , while when  $P$  is positive  $y$  is positive. Hence the conditions for this supposition are as shown in Fig. 3, with no essential change. It is

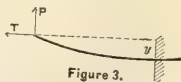


Figure 3.

simply case I turned over. The moment obtained from (19) is the same numerically for  $P +$  as for  $-$  which is evidently as it should be, while for  $T$  changed in sign it would be greater.

Hence, changing the sign of  $T$ , our equation of moments for this case becomes, as evident from Fig. 4, for the origin of moments at  $C$  and of co-ordinates at  $A$ .

$$\epsilon I \frac{d^2 y}{dx^2} = -Ty - Px = M \dots (21)$$



This may be integrated by aid of equation (15), as the signs are proper to it, where,

$$A = \frac{T}{\varepsilon I} = n^2 \quad B = \frac{P}{\varepsilon I} \quad D = 0 \quad F = 0$$



Figure 4.

Hence the integral is

$$\begin{aligned} -Ay - Bx &= \sqrt{\frac{C}{A}} \sin(x\sqrt{A} + C_1) \\ &= \sqrt{\frac{C}{A}} \sin(n\alpha + C_1) \end{aligned}$$

For  $x=0$  let  $y=h$  and

$$\begin{aligned} -Ah &= \sqrt{\frac{C}{A}} \sin C_1 \\ -Ay - Bx &= -\frac{Ah}{\sin C_1} \sin(n\alpha + C_1) \end{aligned}$$

Differentiate and,

$$-A \frac{dy}{dx} - B = -\frac{Ah n}{\sin C_1} \cos(n\alpha + C_1)$$

But

$$\frac{dy}{dx} = 0 \text{ for } x=l$$

$$\therefore B = Ahn(\cos nl \cot C_1 - \sin nl)$$

or

$$\cot C_1 = \frac{B}{Ahn \cos nl} + \tan nl$$

Hence

$$\begin{aligned} -Ay - Bx &= -\frac{B \sin n\alpha}{n \cos nl} \\ &\quad - Ah(1 + \tan n\alpha \tan nl) \cos n\alpha \end{aligned}$$

or, restoring the values of A, B and n, we get the general equation of the curve of the axis of the beam, also the moment at any point,

$$\begin{aligned} -Ty - Px &= -\frac{P \sin n\alpha}{n \cos nl} - \\ &\quad Th(1 + \tan n\alpha \tan nl) \cos n\alpha = M. \quad (22). \end{aligned}$$

The maximum moment of flexure occurs where  $x=l$  and  $y=y_l$ , which is

$$\begin{aligned} -Ty_l - Pl &= -\frac{P}{n} \tan nl - \frac{Th}{\cos nl} = \\ &\quad M_{\max}. \quad (23). \end{aligned}$$

when  $h=0$

$$-Ty_l - Pl = -\frac{P}{n} \tan nl = M_{\max}. \quad (24).$$

When  $h$  is restored, and  $P=0$

$$-Ty_l = -\frac{Th}{\cos nl} = M. \quad (25).$$

III. Let the beam be conditioned as represented in Fig. 5, viz.: fixed at one end, free at the other, with a load P and a pull T at the free end, and a uniform load over its length.

Let  $w$  = distributed load per unit length of beam.



Figure 5.

Then the equation of moments will be

$$\varepsilon I \frac{d^2 y}{dx^2} = Ty - Px - \frac{wx^2}{2} \quad (26).$$

Hence

$$\begin{aligned} +Ay + Bx + Dx^2 &= \frac{C_1}{2} e^{nx} - \\ &\quad \frac{C_2 e^{-nx}}{2C_1 n^2} - \frac{2D}{n^2} + \frac{2D^2}{C_1 n^4} e^{-nx} \end{aligned}$$

where

$$A = \frac{T}{\varepsilon I} = n^2 \quad B = -\frac{P}{\varepsilon I} \quad D = -\frac{w}{2\varepsilon I}$$

To determine the constants of integration make  $x$  and  $y$  zero for the point A. This gives

$$\frac{C}{2C_1 n^2} = \frac{C_1}{2} - \frac{2D}{n^2} + \frac{2D^2}{C_1 n^4}$$

Introducing this, differentiating, and making  $\frac{dy}{dx} = 0$  for  $x=l$  we get

$$\frac{C_1}{2} = \frac{B + 2Dl + \frac{2D}{n} e^{-nl}}{\left(e^{nl} + e^{-nl}\right)n}$$

which introduced, gives us the following general equation of moments, and of the curve of the axis of the beam, T P and  $w$  being restored,

$$Ty - Px - \frac{wx^2}{2} = -$$

$$\frac{P + wl + \frac{w}{n}e^{-nl}}{n} \left[ \begin{matrix} nx & -nx \\ e & -e \\ nl & -nl \\ e & +e \end{matrix} \right] + \frac{w}{n^2}(1 - e^{-nx}) \quad (27).$$

In this equation the sign of  $P$  may be + or -; that is,  $P$  may act down or up. Under certain circumstances the beam will be S shaped, with a point of contra flexure, or of zero moment.

To ascertain this point place the second member = 0 and solve for  $x$ .

The maximum moment is evidently obtained by making  $x = l$ . The equation then will reduce to

$$Ty_1 - Pl - \frac{wl^2}{2} = -\frac{P + wl}{n} \left\{ \begin{matrix} nl & -nl \\ e & -e \\ nl & -nl \\ e & +e \end{matrix} \right\} + \frac{w}{n^2} \left\{ 1 - \frac{2}{e + e^{-nl}} \right\} = M_{\max} \quad (28).$$

If  $w = 0$  this equation reduces to (19), as it evidently should. Also  $P$  may be made zero, leaving simply the uniform load and  $T$ .

IV. Let the condition be as in Fig. 5, except reverse  $T$ , as in Fig. 6.

Then

$$\epsilon I \frac{d^2 y}{dx^2} = -Ty - Px - \frac{wx^2}{2} \quad (29).$$

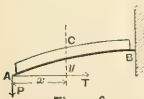


Figure 6.

Applying equation (15) for integrating this

$$-Ay - Bx - Dx^2 = \frac{\sqrt{AC + 4D^2}}{A} \sin(nx + C_1) - \frac{2D}{A}$$

$$\text{where } A = \frac{T}{\epsilon I} \quad B = \frac{P}{\epsilon I} \quad D = \frac{w}{2\epsilon I}$$

To determine the constants of integration make  $x = 0$  for  $y = 0$ , and eliminate the coefficient to 1st term, 2d member.

Then make the tangent to the curve zero for  $x = l$ , and eliminate  $C_1$ , as was done in case II., we then get

$$-Ty - Px - \frac{wx^2}{2} = -\frac{P + wl}{n} \frac{\sin nx}{\cos nl} - \frac{w}{n^2}(1 - \cos nx - \sin nx \tan nl) = M \quad (30).$$

The load  $P$  may be + or -.

Making  $x = l$  for the maximum moment, we get, by reduction,

$$-Ty_1 - Pl - \frac{wl^2}{2} = -\left( \frac{P + wl}{n} - \frac{w}{n^2} \tan \frac{nl}{2} \right) \tan nl = M_{\max} \quad (31).$$

If  $w = 0$ , this expression reduces to (24), as it obviously should. If  $P = 0$  we have simply the uniform load  $w$ , and the end thrust  $T$ .

V. Let the beam be supported at both ends, carry a uniformly distributed load, and have a pull applied at both ends.

The conditions are obviously equivalent in the two parts of Fig. 7, the latter being already solved in equations (27) and (28).

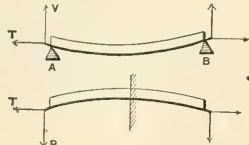


Figure 7.

The equation of moments for this figure is

$$\epsilon I \frac{d^2 y}{dx^2} = Ty - \frac{wlx}{2} + \frac{wx^2}{2} \quad (32).$$

since  $V = \frac{wl}{2}$ . Comparing with (27) we find the 1st member changed to (32) by changing  $P$ ,  $-w$  and  $l$  there, to  $\frac{wl}{2}$ ,  $w$

and  $\frac{l}{2}$  here. By making the corresponding changes in 2d member of (27) we obtain for the 2d member of (32)

$$+ \frac{w}{n^2} \left\{ \frac{e^{n(\frac{l}{2}-x)} + e^{-n(\frac{l}{2}-x)}}{e^{\frac{n}{2}} + e^{-\frac{n}{2}}} - 1 \right\} \quad (32).$$

$l$  being the whole length, AB.

For the maximum moment  $x = \frac{l}{2}$  and

$$Ty, -\frac{wl^2}{8} = \frac{w}{n^2} \left\{ \frac{2}{e^{\frac{n^2 l}{2}} + e^{-\frac{n^2 l}{2}}} - 1 \right\}$$

$$M_{\max} \dots (33).$$

VI. Reverse T; otherwise take the case as in V.

Hence reverse  $w$ , and take  $P = \frac{wl}{2}$  in equations (30) and (31) and change  $l$  to  $\frac{l}{2}$  and we obtain

$$-Ty - \frac{wlx}{2} + \frac{wx^2}{2} =$$

$$\frac{w}{n^2} \left( 1 - \cos nx - \sin nx \tan n \frac{l}{2} \right) = M \quad (34).$$

$l$  being the whole length AB, and for the maximum moment  $x = \frac{l}{2}$ .

$$\therefore -Ty, -\frac{wl^2}{8} = -\frac{w}{n^2} \tan n \frac{l}{4} \tan n \frac{l}{2}$$

$$M_{\max} \dots (35).$$

VII. Let the beam be supported at its ends, with a load Q placed at equal distances from the ends, and have a tension T applied.

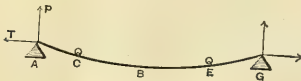


Figure 8.

1st. Then for the part AC, the moments will be

$$\epsilon I \frac{d^2 y}{dx^2} = Ty - Px = Ty - Qx \dots (36),$$

comparing with eq. (13) we get

$$Ay + Bx = \frac{C_1}{2} e^{nx} - \frac{C}{2C_1 A} e^{-nx} \quad (13).$$

where

$$A = \frac{T}{\epsilon I} = n^2 \quad B = -\frac{P}{\epsilon I} \quad \text{and } P = Q \quad (37).$$

For  $x=0, y=0$  and

$$\frac{C}{2C_1 A} = \frac{C_1}{2}$$

$$Ay + Bx = \frac{C_1}{2} (e^{nx} - e^{-nx})$$

Differentiate and let  $\frac{dy}{dx} = \tan i$  for  $x=a$   
 $= AC = EG$ , and

$$\frac{C_1}{2} = \frac{A \tan i + B}{\sqrt{A} (e^{na} + e^{-na})}$$

$$\therefore Ay + Bx = \frac{A \tan i + B}{\sqrt{A}} \left\{ \frac{e^{nx} - e^{-nx}}{e^{na} + e^{-na}} \right\} \dots (39).$$

2d. For the part CB, the moments will be

$$\epsilon I \frac{d^2 y}{dx^2} = Ty + Q(x-a) - Px = Ty - Qa$$

where

$$A = \frac{T}{\epsilon I} = n^2 \quad \text{and } F = -\frac{Qa}{\epsilon I} \dots (40).$$

$$\therefore Ay + F = \frac{C'}{2} e^{nx} - \frac{C_2}{2C' A} e^{-nx} \dots (13).$$

Now differentiate this and make  $\frac{dy}{dx} = 0$

for  $x = \frac{l}{2}$  and

$$\frac{C_2}{2C' A} = -\frac{C'}{2} e^{nl}$$

Put this back in the same equation and make  $\frac{dy}{dx} = \tan i$  for  $x=a$ , and

$$A \tan i = \frac{C'}{2} (e^{na} - e^{n(l-a)}) \sqrt{A}$$

This determines  $C'$  and  $C_2$ , and the values placed in the integral above give

$$Ay + F = \frac{A \tan i}{\sqrt{A}} \left\{ \frac{e^{nx} + e^{n(l-x)}}{e^{na} - e^{n(l-a)}} \right\} \quad (41).$$

Now making the ordinates  $y$ , in the two equations, equal each other for the point C, where  $x=a$  we obtain observing that  $Ba = F$ , (39) = (41), giving an expression by aid of which  $\tan i$  is found. This value of  $\tan i$ , put into eq. (39) or (41), gives the required expressions for the moments on the parts AC and BC, respectively.

Placing the parenthetical part of (39) equal L, and of (41) equal N, we get

$$A \tan i = -\frac{BL}{L - N} \dots (42).$$

The maximum moment on the whole beam will be found at the points C and E, directly under the equal loads Q, equidistant from the ends. This is obvious, from the fact that the moment due to P and Q for any part of CE is constant; but the moment of T, counter to that of P and Q, is least at C and E, for the part CE. As to AC, the moment is greatest at C.

Hence (39) or (41) will give the max. moment which is at  $x=a$

$$Ty_1 - Qa = \frac{Q}{2n}$$

$$\frac{e^{\frac{l}{2}} - e^{-\frac{l}{2}} + e^{-n(\frac{l}{2}-2a)} - e^{n(\frac{l}{2}-2a)}}{e^{\frac{l}{2}} + e^{-\frac{l}{2}}} \quad (43).$$

$$= M_{\max}.$$

If we make  $a=0$  the moment (43) reduces to zero, as it evidently should, as it leaves the beam without load. Again, if  $a=\frac{l}{2}$ , the expression reduces to the same form as (19), P and  $l$  there, being equivalent to Q and  $\frac{l}{2}$  here, a fact that verifies all complex and extended reductions of this case.

VIII. Let this beam be conditioned the same as in VII., except reverse T, as shown in Fig. 9.

The expression for the moment on AC is

$$\epsilon I \frac{d^2 y}{dx^2} = -Ty - Px,$$

where

$$A = \frac{T}{\epsilon I} = n^2 \quad B = \frac{P}{\epsilon I} = \frac{Q}{\epsilon I} \quad (44).$$

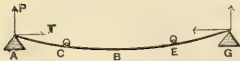


Figure 9.

Hence 1st by (15), making  $x=0$  for  $y=0$ , for one constant, and  $\frac{dy}{dx} = \text{tang } i$  at  $x=a = AC = EG$  for the other constant.

$$-Ay - Bx = -(\sqrt{A} \text{tang } i + B) \frac{\sin nx}{\cos na} \quad (45).$$

the eq. of the axis AC, and of moments for the same.

2d. For the part CB, moment=

$$\epsilon I \frac{d^2 y}{dx^2} = -Ty - Px + Q(x-a) = -Ty - Qa$$

where

$$A = \frac{T}{\epsilon I} = n, \quad F = \frac{Qa}{\epsilon I} = \frac{Pa}{\epsilon I} = Ba$$

Applying (15), first making  $\frac{dy}{dx} = 0$  for

$x=\frac{l}{2}$  for one constant; then making the same equation  $=\text{tang } i$  for  $x=a$ , for the other, we get

$$-Ay - F = -\frac{\sin\left(nx + \frac{\pi}{2} - n\frac{l}{2}\right)}{\cos\left(na + \frac{\pi}{2} - n\frac{l}{2}\right)} \sqrt{A} \text{tang } i \quad (46).$$

Then equating the ordinates  $y$ , from (45) and (46) for  $x=a$ , observing that  $Ba=F$ , we get the expression containing  $\text{tang } i$ . Substituting it in (46) we get the general expression of moments for the part CE, also the equation of the curve of the axis of that part,

$$-Ty - Qa = -\frac{Q}{n}$$

$$\text{tang } na \cdot \sin\left(nx + \frac{\pi}{2} - nl\right)$$

$$\sin\left\{\frac{\pi}{2} - n\left(\frac{l}{2} - a\right)\right\} - \text{tanna} \cdot \cos\left\{\frac{\pi}{2} - n\left(\frac{l}{2} - a\right)\right\} = M \quad (47).$$

For  $x=a$  this becomes

$$-\frac{Q}{n} \frac{\text{tang } na}{1 - \text{tang } n \cot\left\{\frac{\pi}{2} - n\left(\frac{l}{2} - a\right)\right\}} = M_a \quad (48).$$

For  $x=a=\frac{l}{2}$  we get

$$-\frac{Q}{n} \text{tang } n\frac{l}{2} = M_{\max} \quad (49).$$

(49) being greater than (48). This agrees with the indications of Fig. 9.

Equation (49) is the same as (24) as it evidently should.

If  $a=0$  the moment reduces to zero, which the figure shows to be correct.

IX. Let the beam be supported at the ends, be under tension  $T$ , and loaded with  $Q$  applied at any point.

1st. For the part AC we get, origin of co-ordinates at A,

$$\epsilon I \frac{d^2 y}{dx^2} = Ty - Px$$

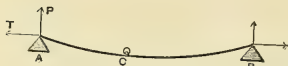


Figure 10.

Applying (13), observing that for  $x=0$   $y=0$  for one constant: and that  $\frac{dy}{dx} = \text{tang } i$ , for  $x=a$  for the other, and reducing we get

$$Ty - Px = \frac{T \cdot \text{tang } i - P}{n} \left\{ \frac{e^{nx} - e^{-nx}}{\frac{na}{e} + e} \right\} \quad (50).$$

From the figure  $Pl = Q(l-a)$

$$\therefore P = Q \left( 1 - \frac{a}{l} \right) \quad (51).$$

If in (50) we make  $a = \frac{l}{2}$  we have  $\text{tang } i = 0$ , and introducing  $P$ , (50) reduces to the same as (19) and (43) for like values of  $a$ , and  $P$ .

2d. For the part BC with some reduction,

$$\epsilon I \frac{d^2 y}{dx^2} = Ty + \frac{Qa}{l}x - Qa$$

Applying (13) again, observing that for  $x=l$   $y=0$ , and  $\frac{dy}{dx} = \text{tang } i$ , for  $x=a$ , and reducing we get

$$Ty + \frac{Qa}{l}x - Qa =$$

$$\frac{T \cdot \text{tang } i + Q - P}{n} \left\{ \frac{e^{nx} - e^{n(2l-x)}}{\frac{na}{e} + e} \right\} \quad (52).$$

This equation reduces to the same as (50), (43) and (19) for like values of  $P$ , by making  $a = \frac{l}{2}$ ; except (52) will have

the negative sign, as it should, since its moment at C should oppose that of (50).

Now make  $x=a$ , and equate (50) and (52). This determines  $\text{tang } i$ . This can be restored to (50) and (52) for moments,

or for equations of the curves of the axis of the parts of the beam. Thus the conditions of the beam are completely determined.

If we make the parenthetical part of (50) and (52) =  $L$  and  $N$ , respectively, we find, for  $x=a$ , in  $L$  and  $N$ ,

$$\text{tang } i = \frac{Q}{n^2} \left( \frac{L}{L-N} - \frac{a}{l} \right) \quad (53).$$

For  $a = \frac{l}{2}$ ; this reduces to 0 as it should.

In seeking the maximum moment we suspect that when  $Q$  is near A, or B at a particular point, the combined moment of  $T$  and  $P$  may possibly have a maximum between  $Q$  and the remote end, because that due to  $T$  varies as the ordinate  $y$  and  $P$  with  $x$ . But the mathematical test applied to (52) develops no such max. Hence the max. is always at the load  $Q$ , and can readily be found at  $x=a$ .

X. Let the conditions be the same as in IX. except reverse  $T$ , or put the beam under compression, as in Fig. 11.

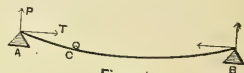


Figure 11.

1st. For part AC

$$\epsilon I \frac{d^2 y}{dx^2} = -Ty - Px$$

where

$$P = Q \frac{l-a}{l}$$

Integrating by aid of (15), making  $x$  and  $y=0$  for one constant, and  $\frac{dy}{dx} = \text{tang } i$  for the other, we obtain

$$-Ty - Px = -\frac{T \text{ tang } i + P \sin nx}{n \cos na} \quad (54).$$

2d. For the part BC we have

$$\epsilon I \frac{d^2 y}{dx^2} = -Ty - (P-Q)x - Qa$$

Applying (15) and make  $x=l$  for  $y=0$  for one constant, and  $\frac{dy}{dx} = \text{tang } i$  at  $x=a$  for the other, and reducing we obtain

$$-Ty - (P - Q)x - Qa = \frac{T \tan i + P - Q}{n} \frac{\sin n(l-x)}{\cos n(l-a)} \quad (55).$$

Equating 2d members of (54) and (55) for  $\tan i$  at  $x=a$ , and then replacing it; the same equations become, for AC,

$$-Ty - Px = \frac{Q}{n} \frac{\sin nx}{1 + \tan n a \cot n(l-a)} \cdot \frac{\sin nx}{\cos na} \quad (56),$$

and for BC,

$$-Ty - (P - Q)x - Qa = - \frac{Q}{n} \frac{\sin n(l-x)}{1 + \tan n a \cot n(l-a)} \cdot \frac{\sin n(l-x)}{\cos n(l-a)} \quad (57).$$

which are equations of the axial curves and of moments.

These reduce to the same as (49) for  $x=a=\frac{l}{2}$ , also to (24) for proper value of  $l$ . Thus (56) becomes

$$\frac{Q}{2n} \tan n \frac{l}{2} = M_{\max} \quad (58).$$

the same as (48), observing that  $Q$  in (48) equals  $2Q$  in the above.

In looking for the max. moment, we observe that when  $Q$  is near A, the moment will without question increase from A to C, because the moment arms of both T and P increase together. Also the moment of the reaction of the support B will increase from B to C. But the moment of T is greatest where the curve of the axis of the beam is lowest, and this is between Q and B. Now when T is great and P small, particularly when T is sufficient to hold the beam in the curved form, the maximum is plainly seen to be somewhat removed from Q towards the middle of beam, but in no case beyond the middle.

The 2d member of equation (57) is the expression for the moment of flexure of BC. Hence the moment varies along BC as the ordinates of a sinusoid the max. value being where  $\sin n(l-x)=1$ , or where  $n(l-x')=\frac{\pi}{2}$ . Hence

$$\therefore \frac{x'}{l} = 1 - \frac{\pi}{2nl}$$

is the fractional part of the beam's length at which the moment may be a

maximum, and where it will exist, in case BC has a less value. At  $x=l$ , or at B, the sinusoid starts, and overspans the beam length AB, as appears from the fact that when  $x=0$ , the value of (57) is still considerable, and positive. To find the springing points of the curve, place

$$\sin n(l-x) = 0$$

giving

$$n(l-x) = 0 \text{ or } \pi$$

Hence

$$x=l, \text{ or } x=l - \frac{\pi}{n} \quad (59).$$

and the sinusoid is BED, for the beam AB, Fig. 12. The max. is at H when

$$AH = l - \frac{\pi}{2n} \quad (60).$$

equations (59) and (60) show that BD is twice BH. Suppose  $n=.01$  and  $l=200$ . Then  $AH=43$ . and  $AD=-114$ .

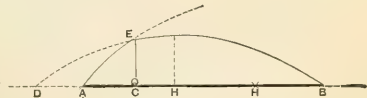


Figure 12.

The figure shows how the max. moment may occur at H when  $Q$  is at C, the curve AE being the sinusoid of eq. (56).

Similarly it may be shown that another point  $H'$  exists where  $BH'=AH$ .

Now when  $Q$  is placed between H and  $H'$ , the max. moment is at Q, but it is at H or  $H'$  when  $Q$  is outside those points.

XI. Let the beam be fixed at one end, supported at the other, under compression T, and loaded with  $Q$  at any point.

Take the origin of co-ordinates at A,  $y$  positive downward and  $Ac=a$ . Then

1st for the part AC (Fig. 13)

$$\begin{aligned} EI \frac{d^2 y}{dx^2} &= -Ty - P(l-x) + Q(a-x) \\ &= -Ty - (Q-P)x - (Pl-Qa) \end{aligned}$$

Integrating by aid of (15) we get

$$-Ay - Bx - F = \frac{\sqrt{AC}}{A} \sin (nx - C_1)$$

where



$$A = \frac{T}{\epsilon I} = n^2 \quad B = \frac{Q - P}{\epsilon I} \quad y = \frac{Pl - Qa}{\epsilon I}$$

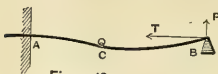


Figure 13.

For  $x$  and  $y=0$  we get

$$\frac{\sqrt{C}}{n} = -\frac{F}{\sin C_1}$$

and for  $\frac{dy}{dx}=0$  for  $x=0$  we get

$$\cot C_1 = \frac{B}{nF}$$

Hence

$$-Ay - Bx - F = -\frac{B}{n} \sin nx - F \cos nx \quad (61).$$

and

$$-A \tan i - B = -B \cos nx + nF \sin nx$$

2d, For the part BC

$$\epsilon I \frac{d^2 y}{dx^2} = -Ty - P(l-x) = -Ty + Px - Pl$$

Hence by (15)

$$-Ay - B'x - F' = \frac{\sqrt{G'}}{n} \sin (nx + C_1')$$

where

$$A = \frac{T}{\epsilon I} = n^2, \quad B' = -\frac{P}{\epsilon I}, \quad F' = \frac{Pl}{\epsilon I}$$

also

$$B'l + F' = 0, \quad B - B' = \frac{Q}{\epsilon I}, \quad a(B - B') = (F' - F)$$

• For  $x=l, y=0$  and

$$-B'l - F' = \frac{\sqrt{C'}}{n} \sin (nl + C_1') = 0$$

$$\therefore C_1' = -nl$$

$$\therefore -Ay - B'x - F' = \frac{\sqrt{C'}}{n} \sin n(x-l) \quad (62).$$

and

$$-A \tan i - B' = \sqrt{C'} \cos n(x-l)$$

Equating  $A \tan i$  for  $x=a$ , from 1st and 2d and  $\sqrt{C'}$  is determined, its value being

$$\sqrt{C'} = \frac{B - B' - B \cos na + nF \sin na}{\cos n(a-l)}$$

But in the present case  $P$  is as yet an unknown quantity, from the fact that  $Q$  is partly supported by the stiffness of the beam at  $A$ , and partly at  $B$ . We may, however, eliminate  $P$  by aid of the condition that the ordinates  $y$  from 1st and 2d are equal at  $x=a$ .

Equating the ordinates  $y$ , we find after much reduction,

$$\frac{P}{Q} = \frac{\sin n(l-a) + na \cos nl - \sin nl}{nl \cos nl - \sin nl} = q \quad (63).$$

or  $P = Qq$ .

If  $a=l, P=Q$ ; and if  $a=0, P=0$ ; which are obviously correct.

The equation of the curve of the axis of the beam for  $AC$ , also the moment of flexure, will be

$$-Ty - Q(q(l-x) - (a-x)) = -Q((ql-a) \cos nx - \frac{q-1}{n} \sin nx) \quad (64).$$

Similarly we have for  $BC$

$$-Ty - Qq(l-x) = -\frac{Q}{n} \left( 1 - (1-q) \cos na + n(ql-a) \sin na \right) \frac{\sin n(l-x)}{\cos n(l-a)} \quad (65).$$

An inspection of the figure shows that there will always be a point of contra flexure in the beam, or where the moment of flexure will be zero.

Trying (64) for this point, placing the 2d member = 0, we obtain

$$(1-q) \tan nx = n(a-ql)$$

or

$$\tan nx = na \frac{\left(1 - q \frac{l}{a}\right)}{1-q}$$

in which  $x$  locates the point of contra flexure, and  $a$  the load. There is most doubt as to the relation of  $x$  and  $a$  when these quantities are small. When very small the tangent approximates the arc, when the fraction to  $na$  is less than 1, which makes  $x$  less than  $a$ .

Trying (65), the 2d member = 0 when  $\sin n(l-x) = 0$ , or  $n(l-x) = 0, \pi, 2\pi, \&c$ . But  $x=l$  when  $n(l-x) = 0$

$$x = l - \frac{\pi}{n} \text{ when } n(l-x) = \pi$$

But according to eq. (59) and Fig. 12,  $x$  in (65) has no value within the limits of the beam for  $a$  varying from 0 to  $l$ .

Hence we conclude that the point of contrary flexure is always between the load  $Q$ , and the fixed end of the beam.

The point of maximum moment is to be found where the 2d member of (65) is a maximum. This occurs where

$$\sin n(l-x)=1 \text{ or } n(l-x)=\frac{\pi}{2}$$

$$\therefore x=l-\frac{\pi}{2n} \quad (60).$$

if we ignore  $a$ . But considering  $a$ , it appears that the max. moment of flexure is always at  $Q$ , except when  $a$  is =, or less than  $x$  in (60); conditions identical with case X, as regards the one point H, Fig. 12.

Either member of (64) makes the moment at A where  $x$  and  $y=0$

$$=-Q(ql-a) \quad (66).$$

But where  $x=a$ , the other limit of  $x$  for this expression, the moment is

$$-Ty-Qq(l-a)=$$

$$-\frac{Q}{n}(n(ql-a) \cos na-(q-1) \sin na) \quad (67).$$

and it is difficult to tell which is the greater, except in particular cases.

An inspection of Fig. 13 shows that if the compression  $T$  can be great enough to hold the beam in a curve while  $Q$  is zero, the force  $P$  will be reversed. Now, if  $Q$  be given some real positive value increasing from zero up, it will eventually make  $P=0$ . But by (63), when  $P=0$ ,  $q=0$ . Hence to find the relation between  $T$  and  $Q$  for this, make  $q=0$  in (64) and (65).

XII. Take the conditions as in XI. except change  $T$  to tension.

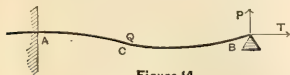


Figure 14.

1st. For the part AC, origin of co-ordinates at A, and  $y$  positive downward,

$$\begin{aligned} \epsilon I \frac{d^2 y}{dx^2} &= +Ty + Q(a-x) - P(l-x) \\ &= Py - (Q-P)x + (Qa-Pl) \end{aligned}$$

Integrating by aid of (13) and determining the constants by the conditions  $x$

$=0$ , for  $y=0$ , and  $\frac{dy}{dx}=0$  for  $x=0$  we get an equation of the curve of the axis of the beam AC, and also the moment of flexure

$$Ty - (Q-P)x - (Qa-Pl) =$$

$$\frac{Qa-Pl}{2} \left( e^{\frac{nx}{2}} + e^{-\frac{nx}{2}} \right) -$$

$$\frac{Q-P}{2n} \left( e^{\frac{nx}{2}} - e^{-\frac{nx}{2}} \right) = M \quad (68).$$

But  $P$  is here an unknown quantity, and is to be found as it was in XI.

2d. For BC

$$\epsilon I \frac{d^2 y}{dx^2} = Ty - P(l-x)$$

$$= Ty + Px - Pl$$

which may be integrated by (13), for  $x=l$ ,  $y=0$ ; giving value to one constant. Then place tang  $i$ , for the point C equal the same from (68), making known the second constant. Then equate the ordinates  $y$  for the point C, by which to determine  $P$ . The work is too tedious to detail here, but the result is

$$\begin{aligned} \frac{P}{Q} &= \\ \frac{e^{-nl} - e^{-n(l-a)} + e^{-nl} + na(e^{nl} + e^{-nl})}{e^{-nl} - e^{-n(l-a)} + nl(e^{nl} + e^{-nl})} \end{aligned} \quad (69).$$

When  $a=l$   $P=Q$ , and when  $a=0$ ,  $P=0$ ; which are correct for these points and verify the result.

The maximum moment of strain for the whole beam, and under all conditions is probably at A, as it is at this point for the case that  $T=0$ . The probability seems to become a certainty from the fact that when  $T$  exists, its moment, which is counter to that of  $Q$ , is greatest where the deflection is greatest, or at intermediate points.

XIII. Let the beam be fixed at both ends, be under tension  $T$  and have a load  $Q$  at the middle, and a uniformly distributed load.

$$\begin{aligned} \epsilon I \frac{d^2 y}{dx^2} &= Ty + \frac{wx^2}{2} - Px + P_1(r+x) \\ &= Ty + \frac{wx^2}{2} + (P_1-P)x + P_1r \end{aligned}$$

where  $P=P_1 + \frac{wl}{2} + \frac{Q}{2}$



Integrating by aid of (13), and observing that for  $x=0$ ,  $y=0$ , and that  $\frac{dy}{dx}=0$ , for  $x=0$  and also for  $x=\frac{l}{2}$ ; and we get,

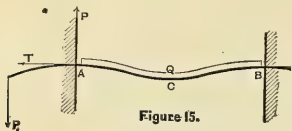


Figure 15.

after reduction, the general equation of moments and of the axis of beam

$$Ty + \frac{wx^2}{2} - \frac{wl+Q}{2}x + P_1r = \frac{wl+Q}{4n}$$

$$\left( \begin{array}{cc} -nx & nx \\ e & -e \end{array} - \frac{2}{e} \frac{2wl}{n^2} - \frac{nl}{e} - \frac{n^2}{e} \right) \left( \begin{array}{cc} nx & -nx \\ e & +e \end{array} \right)$$

$$-\frac{w}{n^2} = M \quad \dots \quad (70).$$

In case the load is only  $Q$ , make  $w=0$ , or if we have only the uniform load, make  $Q=0$  and the resulting expressions will give the moment of flexure at any point in the length of the beam.

At the point A, the moment is a max. and found by making  $x=0$ , and  $y=0$ . Hence, as  $P_1r$ =moment at A, we have,

$$P_1r = \frac{wl}{n} \frac{e^{\frac{l}{n^2}} - e^{-\frac{l}{n^2}}}{e^{\frac{l}{n^2}} + e^{-\frac{l}{n^2}}} + \frac{wl+Q}{2n} \frac{e^{\frac{l}{n^2}} - e^{-\frac{l}{n^2}}}{e^{\frac{l}{n^2}} + e^{-\frac{l}{n^2}}}$$

$$-\frac{w}{n^2} = M_{\max} \quad \dots \quad (71).$$

When  $w=0$ , (71) becomes

$$P_1r = \frac{Q}{2n} \frac{e^{\frac{l}{n^2}} - e^{-\frac{l}{n^2}}}{e^{\frac{l}{n^2}} + e^{-\frac{l}{n^2}}} = M_{\max} \quad \dots \quad (72).$$

But when  $Q=0$ , (71) becomes

$$P_1r = \frac{wl}{2n} \frac{e^{\frac{l}{n^2}} + e^{-\frac{l}{n^2}}}{e^{\frac{l}{n^2}} - e^{-\frac{l}{n^2}}} - \frac{w}{n^2} = M_{\max} \quad \dots \quad (73).$$

At the middle of the beam  $x=\frac{l}{2}$  and the moment, for  $w=0$ , is the same as (72) except the sign is contrary.

But for  $Q=0$ ; instead of (73) we have

$$\frac{wl}{n} \frac{e^{\frac{l}{n^2}} - e^{-\frac{l}{n^2}}}{e^{\frac{l}{n^2}} + e^{-\frac{l}{n^2}}} - \frac{w}{n^2} = M \quad \dots \quad (74).$$

The four last equations give the moments most likely to be needed, and the value of  $P_1r$  put in (70) gives us the equation of the curve of AQ and BQ is like it.

XIV. Take the case as in XIII., except change T to compression.

$$\epsilon I \frac{d^2y}{dx^2} = -Ty - Px + \frac{wx^2}{2} + P_1(r+x)$$

$$= -Ty - (P-P_1)x + \frac{wx^2}{2} + P_1r$$

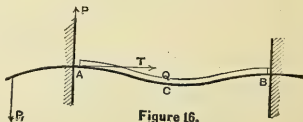


Figure 16.

Integrating by aid of (15), and observing that for  $x=0$ ,  $y=0$ ; and that  $\frac{dy}{dx}$

$=0$  for  $x=0$  and for  $x=\frac{l}{2}$ ; we obtain

$$-Ty - \frac{wl+Q}{2}x + \frac{wx^2}{2} + P_1r =$$

$$= -\frac{wl+Q}{2n} \left( \sin nx + \cot \frac{l}{n^2} \cos nx \right)$$

$$+ \frac{Q}{2n} \frac{\cos nx}{\sin \frac{l}{n^2}} + \frac{w}{n^2} = M \quad \dots \quad (75).$$

At A,  $x$  and  $y=0$ , and

$$P_1r = -\frac{wl+Q}{2n} \cot \frac{l}{n^2} +$$

$$\frac{Q}{2n} \frac{1}{\sin \frac{l}{n^2}} + \frac{w}{n^2} = M_{\max} \quad \dots \quad (76).$$

When  $w=0$  (76), becomes

$$\frac{Q}{2n} \tan n \frac{l}{4} = M_{\max} \quad . \quad . \quad . \quad (77).$$

essentially the same as (58).

But when  $Q=0$  in (76), we have

$$P_1 r = -\frac{wl}{2n} \cot n \frac{l}{2} + \frac{w}{n^2} = M_{\max} \quad . \quad . \quad (78).$$

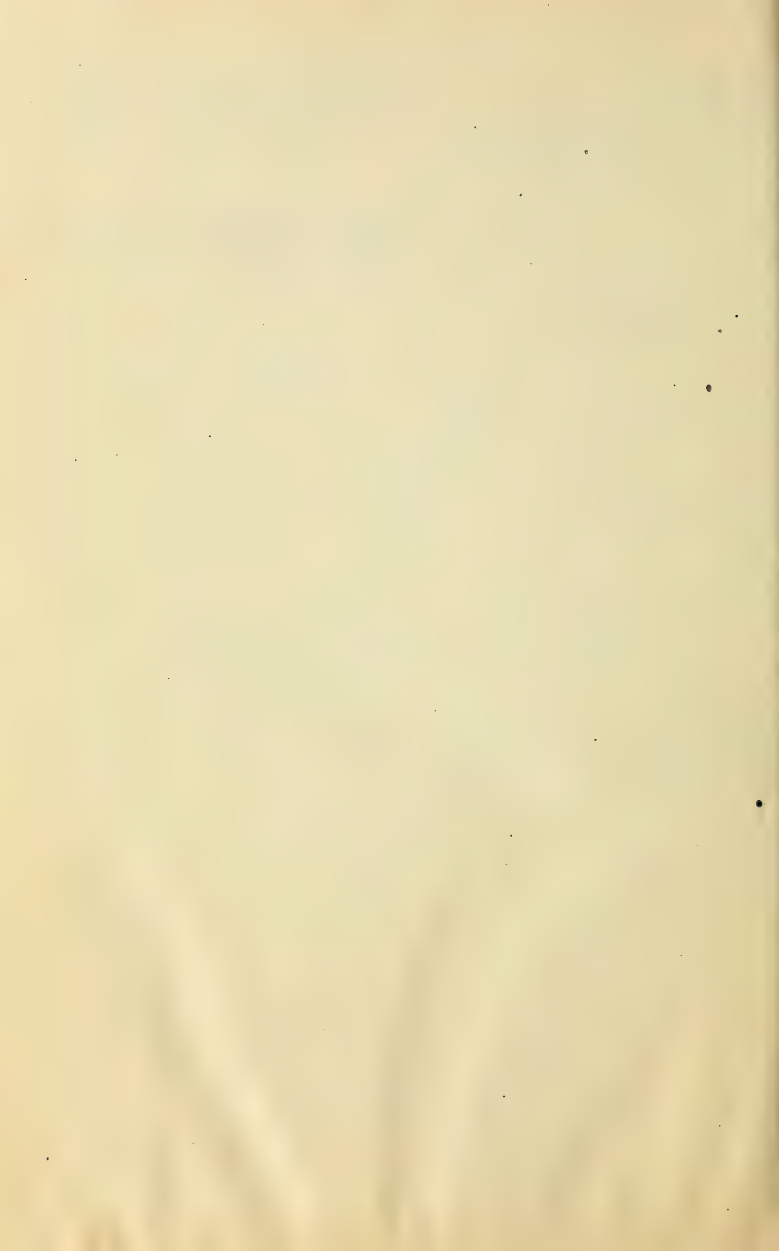
This is the same as at B, where  $x=l$ .  $Q$  still  $=0$

At the middle of the beam  $x=\frac{l}{2}$ , and

the moment for  $w=0$ , is the same as (77) except the sign is contrary. But for  $Q=0$ , instead of (78).

$$-\frac{wl}{2n \sin n \frac{l}{2}} + \frac{w}{n^2} = M \quad . \quad . \quad (79).$$

Thus the most needed moments are obtained, and the equation of the elastic axis of the beam is fully given,  $P_1 r$ , in (75), being made known by (76).



# Strength of Wrought-Iron Bridge Members.

## PART II.—PRACTICAL FORMULAS FOR BEAMS, STRUTS, COLUMNS AND SEMI-COLUMNS.—EXTENDED COMPARISON OF VARIOUS FORMULAS WITH EXPERIMENT.

### GENERAL APPLICABILITY.

All expressions for the moment  $M$ , from equation (17) to (79) inclusive are applicable in equations (6) and (8), the former giving the strain  $t$ , due to the bending moment alone, and the latter the total or max. strain  $t$ , in the section considered. Any section throughout the length of the beam may be examined for strain, but usually the section under maximum strain is the one to be attended to.

It is to be observed that the strain due to  $M$ , is not in any case of the existence of  $T$  to be taken as the only strain. That due to  $T$  directly, according to (7), is to be included. For instance, points of contrary flexure are usually regarded as locating sections which are free from all strain except "transverse shear." But in all cases of points of contrary flexure mentioned above there will be not only transverse shear, but direct longitudinal tension or compression also. Hence the resultant stress will in these cases be diagonal in direction.

• It is to be observed that  $T$  and  $t$  have been universally employed both for tension and compression. This was simply for convenience. In application, the proper distinction is to be made.

In cases where  $T$  is compressive in the above expressions for  $M$ , the beam may be regarded as acting partly like a beam and partly like a column, and we may vary the intensity of action from one almost purely of the first kind to one of the second kind.

### ORDINARY BEAM FORMULAS

But at the limit  $T=0$  some difficulty is experienced as, for instance (77) reduces to  $\frac{0}{0}$  for  $T=0$ . But let the tangent be developed into a series, thus:

$$M_{\max} = \frac{Q}{2n} \tan n \frac{l}{4} =$$

$$\frac{Q}{2n} \left\{ n \frac{l}{4} + \frac{n^3}{3} \left( \frac{l}{4} \right)^3 + \frac{2n^5}{15} \left( \frac{l}{4} \right)^5 + \&c \right\}$$

$$= \frac{Q}{2} \left\{ \frac{l}{4} + \frac{n^2}{3} \left( \frac{l}{4} \right)^3 + \&c \right\} \quad \dots (80).$$

or

$$M_{\max} = \frac{Ql}{8} \text{ for } n=0 \quad \dots (81).$$

This is the same expression for the maximum moment of flexure as we find given in works on the strength of beams for the case of a beam fixed at the ends and a load  $Q$  at the middle; conditions identical with (81) where  $T=0$ .

Similarly, (78), by expanding the  $\cot n \frac{l}{2}$  gives

$$M_{\max} = P_1 r = -\frac{w}{n^2} + \frac{wl^2}{12} + \frac{wn^2 l^4}{720} + \&c + \frac{w}{n^2}$$

$$= +\frac{wl^2}{12} \text{ for } n=0 \quad \dots (82).$$

which is also the same as given for this case.

Making use of the expanded series for  $e^x$ , expressions (72) and (73) will reduce also to (81) and (82). The other expressions of moment above may be likewise reduced for  $T=0$ , to the ordinary well-known formulas.

Thus it appears that the above equations and formulas are general, and the possibility of reducing the same to the ordinary expressions for simple cases corroborates all the circuitous mathematical work.

### FORMULAS FOR COLUMNS, PILLARS, STRUTS, ETC.

In cases where the force  $T$  predomina-

ates, the piece acts mostly like a column. Passing to the limit by making the transverse forces zero, we have from (24) :

$$\frac{-Ty_1 - Pl}{\text{tang } nl} = \frac{P}{n}$$

or

$$\frac{Ty_1}{\text{tang } nl} = 0$$

if  $P=0$ . But as we propose that  $T$  shall be the predominating force applied to the piece, then  $T y_1$  cannot be zero unless  $y_1=0$ , and the latter cannot be assured since  $T$  may produce considerable deflection to one side or the other. Theoretically there would be no deflection, but we know that practically there would be a very appreciable deflection for a piece of ten to twenty or more diameters in length before rupture; hence, we must treat the case as providing for a deflection,  $y_1$ .

Hence it appears that the denominator must be infinite, which requires that

$$nl = \frac{\pi}{2}$$

or, since  $n^2 = T \div \epsilon I$

$$\frac{T}{\epsilon I} = \frac{\pi^2}{4l^2} \quad \dots \quad (83).$$

for a column fixed at one end and free at the other, as in Fig. 17.

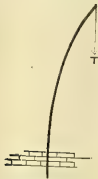


Figure 17.

The same result is obtained from (31). This expression (83) is given in several works, and produced in different direct ways.

Equation (49), for  $Q=0$ , requires, for like reasons, that  $\text{tang } n\frac{l}{2} = \infty$

$$\text{or} \quad n\frac{l}{2} = \frac{\pi}{2}$$

$$\therefore \frac{T}{\epsilon I} = \frac{\pi^2}{l^2} \quad \dots \quad (84).$$

This expression is also obtained from (58), and is for columns having rounded

ends; or, more specifically, pointed bearings. This expression is also given in several works on the strength of beams



Figure 18.

obtained usually by a direct process. By some the column is said to have rounded ends, for this formula, while others do not say whether the ends should be rounded, flat, or otherwise; that is, whether the end of the column is fixed or hinged, &c. The manner of holding the end, however, is not a matter of indifference, equation (49) showing that (84) is for rounded or hinged ends as shown in Fig. 18.

Equation (77) or (78), for  $Q$  or  $w=0$  and  $T$  not, requires that

$$\text{tang } n\frac{l}{4} = \infty \text{ or } n\frac{l}{4} = \frac{\pi}{2}$$

or that

$$\cot n\frac{l}{2} = \infty \text{ or } n\frac{l}{2} = \pi$$

either of which gives

$$\frac{T}{\epsilon I} = \frac{4\pi^2}{l^2} \quad \dots \quad (85).$$



Figure 19.

which is for columns fixed at both ends, or sometimes considered as having flat ends, as shown in Fig. 19.

This expression is not common in published works as applying to columns with fixed ends. An article of much merit which appeared in VAN NOSTRAND'S ENG. MAG., Vol. 17, p. 257, gives the

above equation (84), but does not state whether the columns are for round or flat ends except as indicated by a figure like Fig. 18. But later articles in VAN NOSTRAND'S MAG. by J. D. Crehore and Prof. Baldwin give both (84) and (85,) also (87) with statement of end conditions.

To obtain the expression for a column having one end fixed and the other end rounded, we naturally turn to case XI, above. But the deduction of a satisfactory expression from this is difficult. However, reasoning from analogy, compare Figs. 18 and 19 with their expressions. Thus,

$$\begin{aligned} \text{For Fig. 18, } nl &= \pi \{ \\ \text{For Fig. 19, } nl &= 2\pi \{ \end{aligned} \quad (86).$$

Observing that the curves are sinusoids—see eqs. (22) for  $h=0$  and (47.)—we find AB, Fig. 18, like c D, Fig. 19, both being complete flattened sinusoids. But the middle of the beam at G, Fig. 19, is parallel to the same at A or B; from which we conclude that

$$AD + BC + CD = 2 \text{ sinusoids.}$$

Hence the number of sinusoids in the curves Figs. 18 and 19 agree with the coefficients in the respective expressions (86).

Now for a column which has one end flat and the other rounded, the part CDA, Fig. 19, would represent it nearly, the chief point of difference being in the fact that C, Fig. 19, is not quite on the line of action AB. Assuming that the point D does not essentially change position as C is brought to the action line, then we can safely adopt  $\frac{3}{2}$  as the coefficient to  $\pi$  for the expression corresponding to (86), because in Fig. 18 we have one sinusoid; in B, Fig. 19, two sinusoids, and in CDA  $\frac{3}{2}$  sinusoids.

Now the point C, Fig. 19, is a point of contrary flexure, or a point where the bending moment is zero, and hence the condition of CDA would not be altered by cutting off the column at c and rounding it, thus giving, in CDA, a column with the desired conditions.

Hence the expression

$$nl = \frac{3}{2}\pi$$

$$\frac{T}{EI} = \frac{9}{4} \frac{\pi^2}{l^2} \quad (87).$$

for the case of columns having one end flat or fixed, and the other rounded or pointed.

The conditions are shown in Fig. 20,



Figure 20.

where A is fixed, and B rounded or hinged.

These formulas, (83) and (84), have been proposed for use by some writers, without modification, though apparently with much hesitation and doubt; others have declared them wholly unfit. It appears that Hodgkinson compared (84) in the form

$$T = \varepsilon \pi^2 \frac{I}{l^2} = \frac{\varepsilon \pi^2}{64} \cdot \frac{d^4}{l^2}$$

where

$$I = \frac{\pi d^4}{64}$$

with his experimental results, but finding it discordant, only used it as suggestive of form for an expression for columns, thus:

$$W = C \frac{d^n}{l^m} \quad (88).$$

where  $W$  = wt. sustained,  $d$  = diameter,  $l$  length; and with  $C$ ,  $m$  and  $n$ , constants to be determined by experiment. The differences made manifest by Hodgkinson's experiments between (84) and (88), as to the values of  $m$  and  $n$ , are such, except by further inquiry, as to destroy all confidence in (84) as a formula to use directly in calculating the strength of columns. The same is true of (85) and (87.) This is unfortunate as regards one important fact, viz: (84) contains the moment of inertia of the cross section instead of merely the diameter, so that (84) may be applied to any form of section, such as round, square, oblong, I and H sections &c., while (88) must be pre-









where  $\rho\lambda = k$  when  $T$  is applied at  $E$ , and  $T = \varepsilon K\lambda$

Hence

$Tk = \text{applied moment}$

$< \text{or} > \text{moment of resistance.}$

To make the first and second members equal, we must put  $q = 1$ ; and hence we must also have the neutral axis at a distance,  $k$ , from the center,  $B$ , of the section, for the condition that the column is indifferent as to whether it deflects more or less. If it deflects more,  $y_1$  or  $BE$ , becomes  $> k$ , and  $BD < k$ , or  $q < 1$ , and then the greater the displacement the greater is  $BE = y_1$ , and hence the greater the deflection of the column, Fig. 21, beyond  $y_1 = BE = k$ , the greater is its tendency to deflect, because the applied moment becomes greater than the moment of resistance. But, on the other hand, when the ordinate,  $y_1 = BE$  is less than  $k$ ,  $BD$  is greater than  $k$ ,  $q > 1$ , and the column is stable. It appears, therefore, that  $Tk$  is the greatest admissible applied moment. We, therefore, follow the condition that in eqs. (90) to (92),  $BD = y_1$ .

Now in Fig. 21, we have

$$ad : (BD + d_1) :: 1 : \rho$$

or

$$ad = \frac{y_1 + d_1}{\rho}$$

and

$$\varepsilon ad = t$$

where  $BD = y_1$ ,  $d_1 = Ba = \text{distance from the center of gravity of the section to where the fiber ruptures by compression, and } t \text{ the greatest admissible compressive force per square inch for a unit's length of prism.}$

$$\therefore ad = \frac{t}{\varepsilon} = \frac{y_1 + d_1}{\rho} \quad \dots (93).$$

But combining

$$\frac{\varepsilon I_1}{\rho} = Ty_1 \quad \dots (94).$$

with equations (84), (85), and (87), observing that  $I$  is the same as  $I_1$  in (94), we get for columns

$$\left. \begin{array}{l} \text{with round ends} \dots \frac{1}{\rho} = y_1 \frac{\pi^2}{l^2} \\ \text{with flat ends} \dots \frac{1}{\rho} = 4y_1 \frac{\pi^2}{l^2} \\ \text{with round and flat} \dots \frac{1}{\rho} = \frac{9}{4}y_1 \frac{\pi^2}{l^2} \\ \text{with fixed and free} \dots \frac{1}{\rho} = \frac{1}{4}y_1 \frac{\pi^2}{l^2} \end{array} \right\} \dots (95).$$

Combining these with (93), we obtain

$$\text{for round ends } \frac{tl^2}{\varepsilon\pi^2} = y_1^2 + d_1 y_1$$

or, solving for  $y_1$ ,

$$y_1 = \frac{d_1}{2} \left( \sqrt{1 + \frac{4tl^2}{\varepsilon d_1^2 \pi^2}} - 1 \right) \quad (96).$$

But by eq. (8), the total compression on the critical fiber  $ah$ , Fig. 21, is

$$t = Ty_1 \frac{d_1}{I_1} + \frac{T}{K} \quad \dots (96a).$$

or, introducing  $y_1$  from (96)

$$t = \frac{T}{I_1} \frac{d_1^2}{2} \left( \sqrt{1 + \frac{4tl^2}{\pi^2 \varepsilon d_1^2}} - 1 \right) + \frac{T}{K}$$

and the remaining equations in (95) may be treated similarly.

Solving for the load,  $T$ , borne by the column, we obtain the following general formulæ, viz.: for columns with

Round ends

$$T = \frac{tK}{1 + \frac{Kd_1^2}{2I_1} \left( \sqrt{1 + \frac{4tl^2}{\pi^2 \varepsilon d_1^2}} - 1 \right)} \quad (97).$$

Flat ends

$$T = \frac{tK}{1 + \frac{Kd_1^2}{2I_1} \left( \sqrt{1 + \frac{tl^2}{\pi^2 \varepsilon d_1^2}} - 1 \right)} \quad (98).$$

Flat and round

$$T = \frac{tK}{1 + \frac{Kd_1^2}{2I_1} \left( \sqrt{1 + \frac{16}{9} \frac{tl^2}{\pi^2 \varepsilon d_1^2}} - 1 \right)} \quad (99).$$

Fixed and free

$$T = \frac{tK}{1 + \frac{Kd_1^2}{2I_1} \left( \sqrt{1 + \frac{16tl^2}{\pi^2 \varepsilon d_1^2}} - 1 \right)} \quad (100).$$

We observe that in using the equations (84), (85) and (87), our object is to obtain a relation between  $\rho$  and  $y_1$ , as given by the curves of sines of the elastic axes of the respective columns, and not to employ them as the foundations for the general formulas, because the latter object is found in (93), (94) and (96a), which give the limiting ordinate,  $y_1$ , the moment of flexure, and the limiting strain respectively.

In these formulas  $t$  is the greatest admissible compression per square inch, or the modulus of crushing, for breaking

loads,  $K$ , the sectional area of the column at the middle,  $d_1$  the distance from the center of gravity of the section to the fiber which ruptures first,  $I_1$  the moment of inertia for an axis at the center of gravity of the section, and at right angles to the plane of the axial curve of the deflected column;  $l$ , the length of the column, and  $\epsilon$ , the coefficient of elasticity of the material. Also we have

$$\frac{K}{I_1} = \frac{1}{k^2}$$

where  $k$  is the principal radius of gyration.

These formulas are readily adapted to special forms of section. For instance, for solid cylindrical columns with diameter  $= 2r$ , (97) becomes, for rounded ends,

$$T = \frac{\pi r^2 t}{1 + 2 \left( 1 + \frac{4t^2}{\epsilon r^2 \pi^2} \right)^{\frac{1}{2}} - 2}$$

But it is useless to make these adaptations since the present practice in designing bridge struts requires formulas which will be applicable to all conceivable forms of built struts or columns, such as combined I beams and channel bars, latticed channel bars, &c.

*A Simplified or Approximate Expression.*—In cases where the length of the column divided by the diameter is relatively small, the radical part of the denominator may be developed into a series, by aid of the binomial theorem, for a more convenient expression. In doing this, let us adopt one expression in common for (97), (98) and (99), by placing the numerical coefficient under the radical equal to  $\alpha$ , leaving the general expression for it to be determined later. Also, introducing the principal radius of gyration,  $k$ , we have

$$T = \frac{tK}{1 + \frac{\alpha^2}{2k^2} \left\{ \left( 1 + \frac{\alpha t^2}{\epsilon d_1^2 \pi^2} \right)^{\frac{1}{2}} - 1 \right\}} \quad (101).$$

Now by placing

$$v = \frac{\alpha t^2}{4\pi^2 \epsilon k^2} \text{ and } z = \frac{k^2}{d_1^2} \quad (102).$$

we obtain, with the developed denominator,

$$T = \frac{tK}{1 + v - v^2 z + 2v^3 z^2 - 5v^4 z^3 + \epsilon c} \quad (103).$$

Now, in examining this equation, we find that for very short columns, we only need to retain  $1 + v$ , and the formula then appears independent of  $d_1$ , which indicates reasonably enough that a column failing almost entirely by crushing, might have  $d_1$  reckoned in one direction about as well as in another, for the distance from the center of gravity of the failing cross section to the point of incipient rupture; that is, for crushing on all sides the direction for  $d_1$  is indeterminate, and  $d_1$  as such, is not required.

For lengths somewhat greater, additional terms will be required for the denominator; but eventually, for considerably increased length, the denominator converges too slowly, requiring us to fall back upon the undeveloped denominator.

*Special Simple Formula for Unusually Long Columns.*—But at length we find a limit where the expression (101) will give the same value for the supporting power of the column as the corresponding simpler expression of (84), (85) or (87), which contain no factor for crushing resistance. Beyond this limit, the latter may be employed without hesitation, and failure will be expected to occur by springing instead of crushing.

To obtain an idea of the position of this limit, the ratio of length to diameter has been computed for solid cylindrical wrought iron columns and found to be for columns with

$$\text{ends rounded} \dots\dots\dots \frac{l}{d} = 36.2$$

$$\text{ends flat} \dots\dots\dots \frac{l}{d} = 72.4$$

$$\text{ends round and flat} \dots\dots \frac{l}{d} = 54.6$$

For square, hollow and open-built columns, the ratios are still greater.

Hence, these last named formulas, previously rejected, now return to us again for application to very long columns. For this purpose, fortunately, the objection to these formulas, previously stated, of the absence of the modulus of crushing,  $t$ , has no weight, because failure occurs by springing and not by crushing.

*Criterion for Long Column Formula.*—Evidently this limit is to be found by placing the values of the load  $T$  as given

by the two formulas equal to each other, and then solving for the

$$\text{limiting ratio } \frac{l}{d}$$

For rounded ends we have therefore

$$T = \varepsilon I \frac{\pi^2}{l^2} =$$

$$\frac{tK}{1 + \frac{Kd_1^2}{2I_1} \left( \sqrt{1 + \frac{4tl^2}{\varepsilon\pi^2 d_1^2}} - 1 \right)} \quad (104).$$

To avoid multiplying the solutions, it is desirable to obtain one which includes the three conditions of ends rounded, ends flat, ends round and flat. This may be done by aid of  $\alpha$ , which is = 4 in (104). To adapt a coefficient for the first

member we observe that  $\frac{4}{\alpha}$  is sufficient.

To provide for the fact that  $d_1$  and the radius of gyration  $k$  do not bear a constant ratio to each other, for all columns, assume

$$\frac{d_1}{k} = \beta$$

Then, observing that  $k^2$  is equal, the moment of inertia divided by the section, we have by introducing  $\alpha$  and  $\beta$ ,

$$\frac{T}{K} = \frac{4\varepsilon\pi^2}{\alpha\beta^2} \frac{d_1^2}{l^2} = \frac{t}{1 + \frac{\beta^2}{2} \sqrt{1 + \frac{\alpha tl^2}{\varepsilon\pi^2 d_1^2}} - \frac{\beta^2}{2}} \quad (105).$$

an expression in which the first member,

placed equal  $\frac{T}{K}$ , will give any one of the expressions (84), (85), or (87), by introducing proper values of  $\alpha$  and  $\beta$ . Also the second member of which will give (97), (98) or (99), with like attention to  $\alpha$  and  $\beta$ .

Clearing of fractions we obtain

$$\sqrt{1 + \frac{\alpha tl^2}{\varepsilon\pi^2 d_1^2}} = \left(1 - \frac{2}{\beta^2}\right) + \frac{\alpha tl^2}{2\varepsilon\pi^2 d_1^2}$$

Squaring, and solving for  $\frac{l^2}{d_1^2}$ , we obtain

$$\frac{l^2}{d_1^2} = \frac{4}{\alpha\beta} \left(1 + \frac{1}{\beta}\right) \frac{\varepsilon\pi^2}{t} \quad (106).$$

a formula which serves as the criterion

of applicability for  $\frac{T}{K}$  = first part; or = second part of (105), as a formula for extremely great or for ordinary lengths, respectively.

When the axis for the moment of inertia is an axis of symmetry for the cross section, we have  $2d_1 = d$  = whole diameter of column. This is the thickness in this case in the direction of the plane of the curve of flexure of the column, and is the extreme thickness, whether the column be solid, hollow or open-built.

When the cross section is thus symmetrical, we have

$$\frac{l}{2d_1} = \frac{l}{d} = \pi \left\{ \frac{1}{\alpha\beta} \left(1 + \frac{1}{\beta}\right) \frac{\varepsilon}{t} \right\}^{\frac{1}{2}} \quad (107).$$

As an example, in cylindrical columns,  $d_1$  is the radius of the column, and  $k$  the radius of gyration.

$$\frac{d_1}{k} = 2 = \beta$$

and for flat ends,

$$\alpha = 1$$

Taking  $\varepsilon = 28,000,000$  and  $t = 40,000$ , we obtain from (106) or (107) the value 72.4, the same as given above.

#### FORMULA FOR END CONDITIONS.

Let us now determine a general expression for the qualifying factor  $\alpha$ , an expression which shall duly qualify the general column formulas (105) for the case of fixed ends, flat ends, or of rounded ends (pointed); or for pin ends with large pins under friction, or for flat ends which are narrower than the middle section, or for one of these forms at one end, and another at the other, &c.

From (97), (98), and (99), we already have

$$\left. \begin{array}{l} \text{For pointed ends} \dots \alpha = 4, m = 0 \\ \text{For fixed ends} \dots \alpha = 1, m = 2 \\ \text{For pointed and fixed} \dots \alpha = \frac{8}{3}, m = 1 \end{array} \right\} (108)$$

where  $m$  stands for the moment effect of the end conditions preventing lateral displacement of column at the middle. In Fig. 23, the pointed ends  $a$  and  $b$  offer no hindrance to the side deflection of the middle,  $m$ , of the column, hence in (108)  $m$  is zero. But at  $c$  and  $d$ , there is the stiffeners of the fixed ends, to prevent the middle from deflecting; and hence for this case in (108),  $m = 2$ , sim-

ilarly for the third part of Fig. 23, and of (108)  $m=1$ .

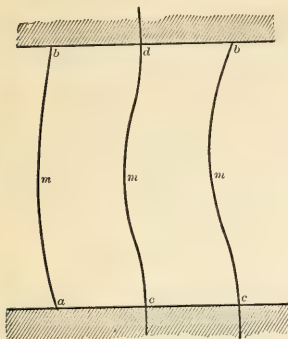


Figure 23.

**Fixed Ends.**—Now if we consider the stiffness at a fixed end as equivalent to a moment  $p_2^l$  preventing lateral displacement of the middle, we may combine it with the end and middle moments due to T as follows:

The expression  $Tk$ , see (92a), appears to be the max. admissible moment of flexure at the middle. Using a similar expression for the end, we have

$$p_2^l = Tk'$$

where  $k'$  is different from  $k$  when the fixed end of column differs in size and form from the middle section. Designating the latter, or radius of gyration of the middle section by  $k_m$ , and of the end surfaces or sections by  $k_c$  and  $k_d$ , we will have the total counteracting moment

$$\left( \frac{l}{p_2} \right) = \frac{Tk_c + Tk_d}{Tk_m} = \frac{k_c + k_d}{k_m} \quad (109).$$

an expression which admits of any size of end sections less than the middle section. Even the ends  $c$  and  $d$  may differ. Now we find by trial that  $a$  may be obtained from the expression

$$a = \frac{4}{\left( 1 + \frac{k_c + k_d}{2k_m} \right)^2} \quad (110).$$

for ends actually fixed.

To illustrate, if  $k_c$  and  $k_d$  are zero,  $a=4$  as for pointed ends, thus producing (97) from (105) as regards qualifying with respect to  $a$ . Again put  $k_c=k_d=k_m$  and  $a=1$ , as for (98). Finally for  $k_c=k_m$  and  $k_d=0$ , we have  $a=\frac{1}{2}$  as required in (99).

But suppose the ends are only half as large as the middle and similar. Then  $k_c=k_d=\frac{1}{2}k_m$  and  $a$  becomes  $\frac{1}{2}$ , the same as for one end pointed and the other as large as the middle, and fixed.

To distinguish between actual fixed ends, and flat ends, it appears that in the former the column cannot fail at the end without a similar failure at the middle. According to the conclusion  $BD=y_1$  in Fig. 22, there must be some tension in the section both at the middle and end of column. That is; the neutral axis is at D when rupture takes place, and outside of D there will be tension. Hence when the end sections are cut as in flat ends; that tension cannot act, and the column is weaker than for actual fixed ends. It appears therefore that the neutral axis should not approach the axis of the flat ends nearer than the outermost surface of the column. As the neutral axis is at D, where  $BD$ =the radius of gyration,  $k$ ; we may obtain in flat ends, the equivalent to fixed ends, by making the radius of gyration of the flat end surface of the column equal to  $d_1$ . This necessitates enlarged, or disc-like ends.

Equation (110) is supposed to meet the real case of fixed ends. To adapt it to the case of flat ends, it is only necessary to replace  $k_m$  by  $d_1$ : because the same value of  $a$  would then be given by (110) thus modified for  $k_c$  and  $k_d=d_1$ , as would now be given by (110), as above, for  $k_c$  and  $k_d=k_m$ . That would make the radius of gyration of the flat end bearing  $=d_1$ , and the neutral axis could not approach the axis at the end of the column nearer than  $d_1$ . Then there would be no tendency to tension in the flat ends, as well as no power to resist it.

Again in built columns it is often the case that thickening pieces are laid on at the ends, thus making the area of the flat ends greater than the sectional area at the middle. From analogy with the usual relation of  $k$  and  $K$  in sections of beams, it appears that the radii of gyration  $k_c$ ,  $k_d$  and  $d_1$ , should each be

multiplied by the square root of the proper section.

Hence, to include the two modifications of (110) now considered, it appears that the equation (110) should be written.

$$\alpha = \frac{4}{\left(1 + \frac{k_c \sqrt{K_c} + k_d \sqrt{K_d}}{2d_1 \sqrt{K_m}}\right)^2} \quad (110a).$$

The meaning of the subscripts is indicated in Fig. 23.

When the end surfaces or sections in every way equal the middle section of the column, the capitals,  $K$ , divide out and disappear, also when the ends are actually fixed  $d_1$  should change to  $k_m$  and thence (110a) returns to (110).

When the flat ends are unenlarged, either in diameter or section, the capitals disappear; but  $d_1$  remains and the denominator of (110a) is smaller than of (110), which makes the strength of columns with unenlarged flat ends less than that for fixed ends, which is evidently as it should be.

In no case should (110a) ever be used when the denominator gives a value greater than the denominator of (110).

**Pin Bearings.**—The pin bearing for the end mounting of a column is usually considered as acting in effect like a knife-edge terminal to the column. But it is evident at once that the friction of the pin must cause the column to act as though the end had some breadth which is appreciable, and hence not to be ignored. To provide for this, let  $r$  be the radius of the pin, and  $f$  the coefficient of friction.

Then, as the column bows to one side or the other, the point of bearing of the hole upon the pin will be thrown to one side a distance  $ox$  Fig. 24, which distance is greater or less according to the value of  $f$ . Now as is well known, the value of  $ox$  is

$$ox = fr.$$

By Fig. 23, this may be designated as  $fr_a$  or  $fr_b$ , as to whether it is expressed or one pin or the other.

In moment effect this is to be treated as an arm for  $T$ , so that the  $Tfr$  here, corresponds with  $Tk$  in respect to the fixed end. Hence, according to (109), we may write

$$\frac{(p, \frac{1}{2})}{Tk_m} = \frac{fr_a + fr_b}{k_m}$$

a quantity which is of the same kind as (109) and may be incorporated in (110a) thus

$$\alpha = \frac{4}{\left(1 + \frac{k_c \sqrt{K_c} + k_d \sqrt{K_d}}{2d_1 \sqrt{K_m}} + f \frac{r_a + r_b}{2k_m}\right)^2} \quad \dots (111).$$

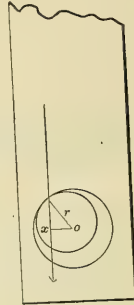


Figure 24.

In bridges, the pin is of considerable size, and the coefficient of friction quite high; probably between  $f=2$ , to  $.3$  for new bridges, and as high as  $.5$  for older ones.

To illustrate, suppose the pin to be 4 inches in diameter at  $a$  and  $b$ . Then  $fr_a = fr_b = .25 \times 2'' = .5''$ , or  $\frac{1}{2}$  inch.

If the column be a solid cylinder, 8 inches in diameter at the middle  $k_m = 2''$ ; and observing that  $k_c$  and  $k_d$  are both zero here, we have

$$\alpha = 3.16$$

As ordinarily treated, this would be taken as 4 instead of 3.16.

**Relative Positions of Pin Bearings.**—Now with respect to knife-edged vs. pointed ends, it is evident that when the knife edges are in one plane, and so oriented as to admit of deflection in the same direction as when the ends are pointed, the supporting power of the column is the same for either form of end. But when the knife edges are in a plane at right angles to the plane of deflection for points, the strength of the column is





rarely deflect diagonally. The minimum load value of the column will be found by computing for the direction of deflection above indicated. If the deflection takes in the direction of the pins,  $\alpha$  is to be found from (111) by ignoring  $r$  and taking  $k_c$  and  $k_d$  as equal the respective values of OA.

If the knife edges be at right angles, the curve, Fig. 25, obtained will be found to have minimum ordinates in the directions of the pins or knife edges.

Fig. 25 applies especially for the long column formula. For shorter columns proper to the formula (101) we will probably find less decided differences between max. and min. radii vectors to Fig. 25 until for short blocks the differences are either indeterminate or indistinguishable.

*Open Column Stays.*—Open built columns are occasionally deficient in trussing or latticing. For instance, two 8" channel bars may be joined by  $\frac{3}{8}$ " plates 10" square riveted on in such a way that the plane sides of the bars are back to back with an intervening space of 6 or 7 inches, the flanges being turned outward. Then if the plates are placed 3' 10" apart along the bars, the column thus constructed will probably be deficient in cross stays. In such case the column will fail to carry the load determined for it by the usual formula and actual moment of inertia of the cross section. To illustrate, the failure may be as shown in Fig. 26 as indeed experiment

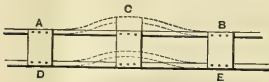


Figure 26.

has given, the parts ABC acting like little columns with fixed ends. It is proposed to find the length of a column made of the same plates fully stayed, which will be equivalent in strength to the actual part AB with its deficient stays. Let  $l' = AB$  less the width of the stay C;  $l'' =$  length of equivalent full-stayed column. Then if the parts AB and DE are regarded as small columns with fixed ends, we have by applying the simple long-column formula, for the purpose of securing a simple correction,

$$T = 4\epsilon I \frac{\pi^2}{l'^2} = 4\epsilon I_1 \frac{\pi^2}{l''^2}$$

where  $I'$  is the sum obtained by finding the least moment of inertia of each of the parts AB DE &c. taken separately and added; and  $I_1$  the least moment of inertia of the entire section of the column obtained in the usual way as such. In this section, the staying is not counted. There the square of the ratio obtained by dividing the equivalent full-stayed column length by the actual column length supposed insufficiently stayed is obtained by solving the above for  $l''^2$  and dividing by  $l'^2$ , giving

$$\left(\frac{l''}{l'}\right)^2 = \frac{I_1}{I'} \left(\frac{l'}{l}\right) \quad \dots \quad (112).$$

This forms a co-efficient for  $l^2$  in any of the column formulas. For instance, if  $\frac{I_1}{I'} \left(\frac{l'}{l}\right)^2 = 3$ , then in formulas (97), (98), or (99), &c.,  $l^2$  therein, should be multiplied by 3, when (112) is less than 1 it is not to be applied. This fact indicates that the column is sufficiently stayed.

*Stay Spacing.*—In the last statement we have the suggestion of a formula for determining the spacing in built columns. That is to say, placing the 2d member of (112)=1, and solving for  $l'$ , we have twice the greatest allowable space between stay points in open-built columns, or,

Greatest admissible space between stay points

$$\frac{l^2}{2} = \frac{l}{2} \sqrt{\frac{I'}{I_1}} \quad \dots \quad (113).$$

Thus, if a column be built of 4 angle bars  $\angle \frac{3}{4}'' \times 3''$ , situated as forming the corners of a 12" square in a column 20' long, the greatest inter-stay space will be about 16 inches. As an example from actual experiment, column No. 33 of G. Bouscaren's report of experiments to the A. S. C. E. gives the spacing of the open column at 18 inches, and it failed by buckling between the lattices. The spacing, according to the formula (113), should not have exceeded about 14 inches, and hence it should have failed, as observed.

As to the space in open columns of different construction, it is evident that  $AB=l'$  is twice the space in Fig. 26, and in the first part of Fig. 27. But in the

second part of the latter,  $AB=l'$  is to be counted as the space where the cross and diagonal staying together serves to fix the ends of the parts,  $AB$ .

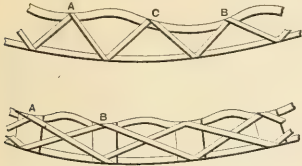


Figure 27.

#### PRACTICAL FORMULAS FOR COLUMNS.

Collecting the formulas which are useful in practice, we have:

For ordinary columns

$$\frac{T}{K} = \frac{t}{1 + \frac{d_1^2}{2k^2} \left( \sqrt{1 + \frac{atl^2}{\varepsilon \pi^2 d_1^2}} - 1 \right)} \quad \dots (114).$$

For very long columns,

$$\frac{T}{K} = \frac{4}{a} \varepsilon \pi^2 \frac{k^2}{l^2} \quad \dots (115).$$

Criterion for applying 114 or 115

$$\frac{l}{2d_1} = \left\{ \frac{\pi^2}{a\beta} \left( 1 + \frac{1}{\beta} \right) \frac{\varepsilon}{t} \right\}^{\frac{1}{2}} \quad \dots (116).$$

$$\beta = \frac{d_1}{k}$$

For adapting to actual end conditions, see Fig. 23.

For flat ends,

$$a = \frac{4}{\left( 1 + \frac{k_c \sqrt{K_e} + k_d \sqrt{K_d}}{2d_1 \sqrt{K_m}} + f \frac{r_a + r_b}{2k_m} \right)^2} \quad \dots (117).$$

For *fixed* ends change  $d_1$  to  $k_m$

Co-efficient for  $T$ , in (114) and (115) for columns deficient in staying,

$$\left( \frac{l'}{l} \right)^2 = \frac{I_1}{I} \left( \frac{l'}{l} \right)^2 \quad \dots (118).$$

Inter-stay spaces in open columns

$$\frac{l'}{2} = \frac{l}{2} \sqrt{\frac{I'}{I_1}} \quad \dots (119).$$

where  $l' = AB$  in Figs. 26 and 27.

In these formulas,

$T$  = load borne by the column.

$t$  = compressive resistance per square inch corresponding to  $T$ .

$K$  = cross section of column,  $K_m$  at middle;  $K_e$  and  $K_d$  at ends, either when flat or fixed, and when flat to be taken as the flat-end surface. Only for supporting members.

$d_1$  = distance from the center of gravity of the section  $K_m$  to where the strain is  $t$ , and measured on the plane of the curve of flexure.

$d = 2d_1$ , in symmetrical cross sections, and equal the diameter of the column reckoned parallel to plane of flexure.

$k$  = radius of gyration of the cross section,  $k_m$ , least radius at the middle of column;  $k_e$  and  $k_d$  radii for the end sections for fixed ends; or of the end surface for flat ends, and to include supporting members only.

$l$  = length of the column.

$\varepsilon$  = coefficient of elasticity of the material composing the column.

$f$  = coefficient of friction of a column on its pin bearing, = about .25 to .5.

$r_a$  = radius of pin at one end of column.

$r_b$  = radius of pin at the other end of column.

$I_1$  = least moment of inertia of the entire cross section of supporting members taken in their actual relative position, and exclusive of staying.

$I'$  = aggregate moment of inertia obtained by finding the least moment of inertia of supporting members taken separately, and adding

$\frac{l}{2d_1} > \text{than in (116), apply (115).}$

$\frac{l}{2d_1} < \text{than in (116), apply (114).}$

$a = 4$  for columns terminated in points or knife edges.

$a = 1$  for columns terminated in fixed ends no smaller than the middle of column.

$a = \frac{1}{3}$  for columns having one end pointed and one end fixed and large as middle.

$a = (117)$  in other cases.

#### OTHER FORMULAS.

The well-known formulas of Hodgkinson appear to be the first of substantial value, their constants being wholly em-



pirical. They were applicable to only a few forms of cross section, and entirely inadequate to the present engineering practice.

Lewis Gordon determined the constants for Tredgold's formula from the experiments of Hodgkinson, which, on account of its partly theoretical basis, was found to have a much wider range of applicability than Hodgkinson's formula. It came into quite general use, and was known as Gordon's formula. Rankine has displaced the least diameter,  $h$ , in this formula by the least radius of gyration, thus producing the most acceptable formula in use to-day. (\*See last page.)

The form of this expression is:

$$w = \frac{fK}{1 + a \frac{l^2}{k^2}} \quad \dots \quad (120).$$

where  $f$  and  $a$  are empirical constants, the former being nearly the ultimate resistance to crushing;  $K$  and  $k$ , the cross section and its least radius of gyration respectively, at the middle of the column length,  $l$ . The values adopted by different engineers for  $f$  and of  $a$  differ greatly, even for a given material, so that in bridge specifications it is common to see the chosen values of  $f$  and  $a$  given. Besides this, it is impossible to determine values for  $f$  and  $a$  for any particular material, except by actual column experiments—a fact which practically limits the formula to a few materials, and even then to a comparatively few experiments. Hence, a general formula whose constants consist of such factors as the coefficient of elasticity, modulus of crushing, &c., seems, by reason of the plentitude of these factors, very desirable.

These facts have caused search for such theoretical formula. One of the first formulas of this kind appears to have been proposed by Reuleaux, and published in *Der Constructeur*, the same being quoted by Ritter in his translation by Sankey of *Bridges and Roofs*, in 1879. See *Sankey's Ritter*, p. 345. The first edition was published in 1862.

This expression for rounded ends is of the form

$$w = \frac{cK}{1 + \frac{cKl^2}{8\epsilon I}}$$

$$= \frac{cK}{1 + \frac{c}{8\epsilon} \frac{l^2}{k^2}} \quad \dots \quad (121).$$

where  $c$  = resistance to compression, proposed to be taken within the elastic limit for a safe load,  $\epsilon$  the coefficient of elasticity.  $K$ ,  $l$  and  $k$  as before. The form of (121) is seen to be the same as (120). That is to say, the load for a given material is equal to a constant times the section; divided by  $1 +$  a constant times the square of the ratio of the length to the radius of gyration of cross section

Notwithstanding the agreement in form, (121) has the advantage of applicability to all materials for which  $C$  and  $\epsilon$  are known, for many of which (120) might not be known. Even if (121) should give discrepancies as it stands, an empirical qualifying coefficient could be found which would probably be nearly the same for one material as another.

An expression of the same form as (121) for round ends was proposed by Mr. J. D. Crehore, and published in *VAN NOSTRAND'S MAG.* for Dec., 1879, under the title, "A New Rational Formula for Pillars." Mr. Crehore's formula however differed in displacing 8 by  $\pi^2$  in the denominator of (121). To account for this, Reuleaux treated the axis of the deflected column as a circle arc, while Crehore showed it to be a sinusoid. Hence Crehore's formula for rounded ends was

$$w = \frac{CK}{1 + \frac{Cl^2}{\pi^2 \epsilon k^2}} \quad \dots \quad (122).$$

An expression identical with this for columns with round ends was given in an article by E. Hatzel, translated for *VAN NOSTRAND'S ENG. MAG.* for Sept., 1877; except in Hatzel's formula the moment of inertia was taken for an axis at other points in the section than the center of gravity; whence the radius of gyration  $k$  would be other than the principal radius.

Also Crehore showed that for flat ends the 2d term of the denominator of (122) should be divided by 4, and for one flat and one rounded end it should be divided by  $\frac{1}{2}$ .

Crehore's formulas were reproduced in an elaborate article by Professor W.

Baldwin, and published in VAN NOSTRAND'S MAG. for May, 1880, with due credit to Mr. Crehore. But in the same article Professor Baldwin utterly abandons these formulas, and proceeds to the discussion of the Gordon formula containing the least thickness  $h$ , and of the Rankine formula containing the least radius of gyration  $k$ . Adopting the latter, its constants are determined from a great number of experiments cited, and for a variety of materials. But no attempt was made to generalize by retaining  $C$  and  $\varepsilon$ . The reason given is that  $\varepsilon$  is not constant in failing material, and at the point of rupture is unknown. This is to be admitted, especially in tension; but in compression the value remains very nearly constant for both cast and wrought iron. This is fortunate, because the chief factor concerned in the strength of columns is the compressive resistance. As the column fails by deflecting to one side, the material is most severely compressed at the concave side, and only a small portion of the cross section will be involved in incipient fracture. Existing results of experiment show that  $\varepsilon$  is practicably constant for compression of cast and wrought iron to near the failing point, where it drops suddenly from 10 to 20 per cent. Hence if a tenth of the section is effected by 15 per cent. reduction in  $\varepsilon$ , the resulting effect upon the whole section would be one and one-half per cent., a quantity which may be ignored in calculating the strength of columns. Hence we propose to compare the rational formulas with experiment before giving them up.

But before taking up numerical facts we observe that the Reuleaux, Hatzel, or Crehore formula differ from the rational formula (97) for rounded ends, believed to be given for the first time in this article, in the form of the denominator. To show that this difference is an important one, we have from Fig. 21

$$ab : bB :: BA : \rho$$

$$\text{or} \quad ab : d_1 :: 1 : \rho$$

Also (4 $\frac{1}{2}$ ) gives  $t_1 = \varepsilon ab$

$$\therefore \quad \frac{1}{\rho} = \frac{ab}{d_1} = \frac{t_1}{\varepsilon d_1} = y_1 \frac{\pi^2}{l^2}$$

the last expression being found in the first of (95).

whence

$$y_1 = \frac{t_1 l^2}{\varepsilon d_1 \pi^2}$$

in which  $t_1$  is the compressive force which is sufficient to cause the shortening  $ab$  and a force which is due to bending only. Combining this with (8) or (96 a) we have

$$t = \frac{T t_1 l^2}{\varepsilon I_1 \pi^2} + \frac{T}{K}$$

which, solved for  $T$ , gives for columns with rounded ends,

$$\begin{aligned} T &= \frac{tK}{1 + \frac{t_1 K l^2}{\pi^2 \varepsilon I_1}} \\ &= \frac{tK}{1 + \frac{t_1 l_2}{\pi^2 \varepsilon k^2}} \quad \dots \quad (123). \end{aligned}$$

an expression identical with Crehore's, except that  $t_1$  is not the compressive resistance; Fig. 21 showing that it is only a part of it. In this expression  $t$  is the total compression represented by  $ad$ , and hence for rupture the total compression  $t=C$  of Crehore's formula. But  $t_1$ , represented by  $ab$ , cannot be  $C$ , and hence some oversight appears to have been committed in making it  $C$  in formula (122). This explains the difference in form between (97) and (122); and gives sufficient cause for a disagreement of one or the other with experimental results.

In the developed denominator of (97) see (102) and (103), we have in the terms,  $1+v$ , (observing that  $\alpha=4$  for rounded ends) the identical denominator of (122). Hence to the remaining terms of the denominator of (103) we may look for the compensating quantity for the error  $C=t_1$ . The same fault is common to the Reuleaux, and to the Hatzel formulas though in the former a compensating effect appears to be provided in the values compounded of  $C$  and  $\varepsilon$  for use; and in the latter in assuming the moment of inertia axis at or near the convex side of column.

*Direct Comparison.*—But the column formula problem is one which cannot be satisfactorily settled for practical men from a purely theoretical standpoint. I therefore offer the following comparison of column formulas. As the numerator

may be considered as practically the same in all, the denominators only are compared.

Hence for the denominator we have for the

$$\text{Gordon formula, } 1 + a \frac{l^2}{h^2}$$

For round ends. Round and fixed. Fixed.

$$a = \frac{4}{3000} \quad \frac{2}{3000} \quad \frac{1}{3000}$$

$$\text{Rankine formula, } 1 + b \frac{l^2}{k^2}$$

For round ends. Round and fixed. Fixed.

$$b = \frac{4}{36000} \quad \frac{16}{9} \frac{1}{36000} \quad \frac{1}{36000}$$

By G. Bouscaren, C.E., and adopted by Keystone Bridge Company.

$$\text{For round ends. Round and fixed. Fixed.}$$

$$b = \frac{2}{36000} \quad \frac{3}{2} \frac{1}{36000} \quad \frac{1}{36000}$$

$$\text{Reuleaux formula, } 1 + \frac{Cl^2}{8\epsilon k^2} \text{ round ends}$$

$$\text{Crehore formula, } 1 + q \frac{Cl^2}{\pi^2 \epsilon d_1^2}$$

For round ends. Round and fixed. Fixed.

$$q = 1 \quad \frac{1}{2.28} \quad \frac{1}{4}$$

$$\text{New formula, } 1 + \frac{d_1^2}{2k^2} \left( \sqrt{1 + \frac{atl^2}{\pi^2 \epsilon d_1^2}} - 1 \right)$$

For round ends. Round and fixed. Fixed.

$$a = 4 \quad \frac{16}{9} \quad 1$$

From these expressions for the denominators, I have computed the results found in the following

TABLE OF VALUES OF DENOMINATORS FOR WROUGHT IRON.

Data.	End.	Gordon.	Rankine.	Bouscaren-Keystone.	Crehore.	New.
Solid cylinder....	Rounded....	5.8	7.4	4.2	9.23	5.20
$l=10$ ft.....	Round and flat.	3.4	3.84	3.4	4.66	3.74
Diam.=2 in.....	Flat.....	2.2	2.6	2.6	3.06	2.50
Bar $2 \times 12$ in.....	Rounded....	5.8	5.8	3.4	7.19	4.06
$l=10$ ft.....	Round and flat.	3.4	3.13	2.8	3.75	3.06
	Flat.....	2.2	2.2	2.2	2.54	2.17
Hollow cylinder...	Rounded....	4.00	1.26	1.13	1.33	1.30
Diam. 8 in. and 6 in.	Round and flat.	2.50	1.14	1.10	1.15	1.17
$l=10$ ft.....	Flat.....	1.75	1.06	1.06	1.08	1.08
Hollow Rectangle..	Rounded....	3.70	2.49	1.74	2.92	2.16
$8 \times 15$ in. $\times 6 \times 13$ in.	Round and flat.	2.35	1.65	1.56	1.85	1.74
$l=30$ ft.....	Flat.....	1.67	1.37	1.37	1.48	1.39
Means.....		3.231	2.828	2.213	3.353	2.464

For the last two columns  $t=C=40000$ ,  $\epsilon=23370000$ , and  $\frac{t}{\epsilon \pi^2} = \frac{1}{7000}$ .

The first three formulas named in the table have been in quite general use, and yet the results shown in the table obtained from them differ in some cases nearly four hundred per cent., as for instance for the Gordon formula applied to hollow cylinders.

Results by the Crehore formula run high in value, one-half of all in the table going above those by the first three named formulas. It appears to give bet-

ter results for hollow than for solid sections. But the large denominator gives small column load so that the formula errs on the safe side.

Results by the new formula are seen in every case but two, to fall between those of the first three "old reliable" formulas, and those two are outside only from one to three per cent. In comparing the means, we see that the new formula falls between the first three. If we reject the Gordon formula, which is now going into disuse in the most approved practice, and compare the new formula

with the 2d and 3d columns of results, we find the mean by the new formula falls between the means of the 2d and 3d columns. Indeed it differs but little over two per cent. from the means of the two columns. This appears the more favorable from the fact that the results in the 2d and 3d columns are obtained from formulas which are probably the best in use to-day in the engineering world.

Comparisons have not been made for other materials than wrought iron, for the reason that wrought iron is the chief material in use at present in large trusses where struts are required.

#### FORMULAS COMPARED WITH EXPERIMENT.

To make the comparison of the new formula with others in such a way as will be yet more satisfactory to practical men, the breaking load of 33 columns of wrought iron, boxed and open built, such as used in bridges, has been computed and placed opposite the breaking load found by actual test in a testing machine. Also in the table is placed the calculated breaking load as found from the Rankine formula, the Bouscaren-Keystone formula, and of the Rankine formula as worked over by Prof. Baldwin for new coefficients, and given in his article above referred to.

In all cases except in Baldwin's formula, the coefficient in the numerator corresponding to the resistance to crushing, was taken at 40,000 lbs. In Baldwin's formula all the coefficients were used as given in the Magazine. The value of  $\epsilon$  for the new formula was used, except in a few cases, as given by the experiments, when given. Corrections were made for pin friction, and for excessive stay spacing for two cases. But these probably effect the final result only 2 or 3 per cent., because the number of corrections needed were so few. But the per cent. for the individual cases was sometimes very considerable. The breaking loads stated are per square inch of cross section of column.

The experimental results cited are from a paper by G. Bouscaren to the Am. Soc. Civ. Engrs. on the strength of wrought iron columns. They are stated by some writers to be from Lovet's report, though I find no mention to this effect in the paper to the society.

The columns cited are of five distinct forms of built columns, viz.:

- P. "Phoenix," hollow cylinder, four flanged segments riveted.
- K. "Keystone," octagonal tube, four flanged segments riveted diametrically.
- A. "American," two flanged bars riveted to the flanges of a central I beam.
- S. "Square," hollow, two plates and two channel bars riveted with flanges outward.
- O. "Open," two channel bars, flanges outward, latticed with slats, riveted trellis-like.

The signs in the last four columns are proper to make the quantities there appearing, correct the computed values of the resistances to agree with the resistances by experiment.

The sums, + and -, appearing at the foot of the first two columns qualified with signs make it appear that the formulas give results which are too large. Hence it appears that the 40,000 used in the numerator of the Rankine and Bouscaren-Keystone formula is too high. It was used in the Rankine formula for convenience, and because it is found in the Keystone formula. But as Rankine gave the formulas the quantity was 36,000, the same as in the Baldwin formula for flat ends, for which also the denominators agree. Hence the quantities by the Baldwin formula down to No. 5 may be regarded as coinciding with Rankine's. The values in Rankine's space from No. 5 down for round ends should be reduced 10 per cent. to change from 40,000 to 36,000. In order to present the results as would be thus given for Rankine's formulas unmodified, or for the numerator at 36,000, they have been worked out and given in the second set at the foot of Rankine's column of differences. The reduction from 40,000 to 36,000 is evidently too great as in one set the - values predominate, while in the other it is with the + values. An estimate made on this score would indicate that 38,000 would be about the best value for the Rankine formulas, the same indeed as is known to be in use by some Ry. Cos. It appears also that 40,000 is too great for the Keystone formula.

In glancing over the four last columns



TABLE OF COMPUTED RESULTS COMPARED WITH EXPERIMENTS.—BUILT WROUGHT  
IRON COLUMNS.

No. and style.	Length feet.	Breadth inches.	Sec. area sq. in.	$k^2$	£ Millions.	Resistance per sq. ins. Experiment lbs.	Rankine formula.	Bouscaren-Keystone formula.	Baldwin formula.	New† formula.	Difference, Rankine.	Difference, Keystone	Difference, Baldwin.	Difference, new.
9.K	15	8.85	23.67	7.833	24.7	32000	35900		32300	34500	—	3900.	—	2500.
2	5	10.1	14.25	11.044	—	33600	39600		35670	39300	—	6000	—	5700.
5	27	12.	18.83	11.424	28.1	21100	31870		28800	30800	—	10770	—	9700.
4	27	9.5	19.20	12.041	26.5	25000	32600		29300	29800	—	7600	—	4800.
7	27	8.62	18.83	9.798	23.7	27900	30800		27700	29800	—	3000	+	2000.
6	27	9.38	14.49	11.178	27.5	27500	31900		28700	29200	—	4400	+	1700.
0	27	9.5	15.13	11.464	19.3	30000	32100		28900	29400	—	2100	+	600.
1	27	12.	15.13	11.464	23.6	25400	32000		28800	30900	—	6600	—	5500.
9.A	27	10.	20.10	13.510	25.0	27800	32900		23900	31800	—	5100	—	4000.
0.P	27	8.12	13.70	8.935	19.1	31000	30200		27100	30000	+	800	+	1000.
9	28	8.25	13.58	8.935	28.5	36600	29600		26600	39300	+	7000	+	7300.
6	15	8.05	14.09	8.536	27.4	37500	36200		32600	35400	+	1300	+	2100.
8	28	8.25	13.58	8.935	25.7	34800	29600		26600	28400	+	5200	+	8200.
3.S	24	10.	13.70	11.628	28.9	33200	33400		30100	32700	—	200.	+	500.
2	26	10.	13.60	9.347	27.8	30000	31000		27920	3.000	—	1000.	+	300.
0.A*	27	10.5	26.05	10.909	30.1	30200	31600		28400	30500	—	1400	+	600.
0.O.*	12.25	9	6.00	18.06	(24.)	17600	38700		34800	18100	—	21100	—	1400.
7	27.48	14.	12.08	19.98	—	29600	34750		31300	33200	—	5150	—	500.
3	23.	14.	13.48	20.69	—	32300	36300		32600	34900	—	4000	—	3600.
9	23.	2.8	6.60	0.70	—	35400	39100		35200	38800	—	3700	—	2600.
0	1.61	2.8	6.60	0.70	—	35700	39100		35200	38700	—	3400	+	3400.
1	27.5	14.	13.74	20.79	—	32400	34960		31400	33600	—	2560	+	3000.
2	27.5	13.	11.05	21.26	—	32300	32600		29400	30950	—	300	+	1200.
5.K	27.	11.6	13.12	10.945	29.5	22000	19360	26100	19600	20070	+	2640	—	1350.
3.A	20.	8.	12.50	5.497	28.9	26700	18500	25200	14760	24000	+	8200	+	1930.
3	26	12.	25.05	18.215	30.4	24000	25100	30800	17800	26800	—	1100	+	2700.
1.S	25.75	10.	13.60	11.000	31.0	25500	20400	27000	20800	25600	+	5100	—	2800.
3.O	28.53	10	5.68	20.07	32.4	31700	23200	30300	33600	27600	+	8500	+	100.
3	34.00	10.25	7.48	8.73	(24.)	23130	12800	19400	12310	19800	+	10330	+	4100.
1.P	25.19	8.12	13.89	8.935	27.1	21700	18260	25100	18220	20160	+	3440	—	3330.
7.A	20	10.	19.90	8.733	23.1	26500	23080	29270	24130	25140	+	3420	+	1540.
4	26	10.	20.72	8.733	26.	22000	17870	24800	17900	21300	+	4130	—	1360.
Sum of + discrepancies.....											+ 60060.	+ 20930.	+ 85790.	+ 35810
Sum of - discrepancies.....											— 110780	— 132050	— 61770.	— 53900
Mean discrepancy, regardless of sign.....											5177.	4636.	4471.	2718
Mean discrepancy, regardless of sign, rejecting Nos. 20 and 34.....											4010.	3469.	3326.	2661
Rankine formula sum of + discrepancies for numerator = 36000.....											+ 102310.			
Rankine formula sum of - discrepancies for numerator = 36000.....											— 59870			
Mean discrepancy, regardless of sign.....											4915.			
Mean discrepancy, regardless of sign, rejecting Nos. 20 and 34.....											3769.			

\* Insufficiently stayed or trussed. Correction (118) applied for the new formula † Simply a single piece of channel bar, about 2.8" × 12".  
‡ For the new formula the flat ends were regarded as fixed because of the enlargement of ends, strengthening by special riveting, &c.

it is seen that in the first the — signs are chiefly among the results for flat ends, while the + signs predominate at the round ends. This indicates that the Rankine formulas are constitutionally at fault, or perhaps that the 1,  $\frac{1}{3}$ , and 4, coefficients to the last term of the denominator for flat, flat and round, and round, ends differ too much. As adopted in the Bouscaren-Keystone formula, viz.: 1,  $\frac{1}{3}$  and 2, the discrepancies would probably be less, as indeed the column footings show. With these coefficients it would appear that a better numerator would be about 38,000.

The column of differences due to the Baldwin formula are found to be far more satisfactory than either of the two preceding it. That is to say, the signs are more generally intermixed, the + and — values sum up more nearly equal to each other numerically, and the average discrepancy, without sign is smaller.

If, however, Nos. 20 and 34 were cut out from the table, the + and — sums would more nearly agree in value for the Rankine formula than for any of the others. But the mean error without sign would be higher than for any of the others, as indicated by the figures given. Though the Baldwin formula still excels the Rankine and Keystone formulas in the smallness of mean error, yet the difference in + and — sums is greater.

But in every respect we find the last column of figures, which are due to the new formula, by far the most favorable. That is to say, the individual discrepancies in that column run lower in value, the number of + and — values are more nearly equal; the absolute values of the sums of the + and — quantities are lower and differ less; and the mean error, or discrepancy, is lowest. This, together with the fact that the theoretical values, 1,  $\frac{1}{3}$ , and 4 are employed, whereas in other formulas, they seem to differ too much, would indicate that the new formula is more nearly theoretically perfect than any of the others. But, in spite of these advantages, the new formula is, unfortunately, less convenient in application than the others, and the question will doubtless arise in practice, whether or no, for an important structure, to sacrifice the additional hour required for the more trustworthy results by the new formula.

As the present object is formulas for

bridges, and as wrought iron is the material chiefly employed, no attempt has been made to compare the new formula with others for other materials than wrought iron. It seems probable, however, that where the coefficient of elasticity,  $\epsilon$ , is practically constant nearly to the point of rupture, the formula may be used without hesitation. The point of rupture is here meant to be either for rupture by tension or compression. For such a material as cast iron it may be necessary to be guided partly by empiricism, especially for long columns, where the rupture may take place on the convex side by tension, because, in tension, the  $\epsilon$  rapidly falls off in value, as rupture is approached. But in compression,  $\epsilon$  is more nearly constant, and hence in short columns the formula will probably apply with greater exactitude.

The great difference in the ultimate resistances to tension and compression in cast iron will also cause an approach to rupture on the convex side, relatively, much sooner than for other materials, so that the rapidly diminishing value of  $\epsilon$  will effect much shorter columns than otherwise. For cast iron in particular, therefore, it may be necessary to use a low value of the modulus of compression and of  $\epsilon$ , and more so as the length increases, say 60,000 to 80,000 for the former, and 12 to 20 million for the latter.

A rational formula must certainly prove much more satisfactory for a comparatively new material, such as some of the grades of steel, than an entirely empirical formula which has not been adapted, that is, in cases where reliable values of the compressive resistance and of  $\epsilon$  are known, and not of the constants in the empirical formulas.

#### MULTIPLYING EMPIRICAL FORMULAS.

Where numerous results of experiments exist for particular classes of columns, it may be possible to adopt an empirical formula for each class, or part of a class, which shall give the results for such columns, or at least to reproduce the particular values to which those formulas are adapted, with closer agreement than any single or perfectly general formula would do. But this process leads to some degree of confusion in the considerable number of formulas produced, and new ex-

periments may develop need of additional formulas, or require a modification of former ones.

In the above tables, comparisons were made only with formulas which are proposed to be perfectly general. But *Trautwine's Pocketbook* cites six different formulas by D. J. Whittemore, C. E., which, accordingly, would be required in computing strains for three of the forms of columns in the above table, and including only 17 of the experimental tests. Though Whittemore gives 12 different formulas, only 6 apply, and half of the experimental columns cited in the table are left by him without a formula.

In a recent paper by Prof. Wm. H. Burr, ten different formulas are produced from twenty-nine experiments. The experiments are mostly cited in the above table, and the formulas, when the whole ten are used, each for its intended form of column, give results agreeing remarkably well with the experiments. The mean error, regardless of sign, is 1720—a quantity less by about 33 per cent. than the mean by the new formula from all the experimental columns cited in the above table, viz., 2661 (two being left out). But when we observe that in this comparison, the new formula, obtained independently of all experiment or specified material, is arraigned before 10 formulas which were obtained from the very experiments compared with, and at the rate of one formula to three experiments, it does not seem strange that the ten formulas should reduce the mean error. Considering the idiosyncracies of column tests, are we at all confident that in extending the application of the 10 formulas to 30 new tests, the mean error will remain as low as indeed either of the values cited?

#### FACTOR OF SAFETY IN COLUMNS.

The usual way of providing for safe loads for columns is to take a certain fractional part of the breaking load; say such a fractional part as is taken in eye bars. The fraction  $\frac{1}{5}$  is common. Thus, the ultimate resistance of wrought iron to tension is about 50,000 lbs. per square inch, and the  $\frac{1}{5}$  part, or 10,000 lbs., is almost an absolute conventionalism among bridge builders, and may be regarded nearly in the sense of an absolute modulus of working resistance to tension.

Accordingly,  $\frac{1}{5}$  is prefixed to column formulas (Rankine's and Gordon's) by many bridge engineers, as giving the proper fractional part of the ultimate resistance, which is to serve as the safe working resistance. But in empirical formulas, where the composition of the constants is unknown, this is a blind practice, because, from analogy with eye-bar strains,  $\frac{1}{5}$  of the ultimate compressive resistance of the *material* is evidently meant, instead of  $\frac{1}{5}$  of the resistance of the *column*.

This matter can be corrected in the Rational formulas, and it will be seen that the " $\frac{1}{5}$ " coefficient to the empirical formulas for columns gives an unintentionally small safe load. A glance at formulas (114) and (120) will suffice for this. Thus, (114) shows that by using  $\frac{1}{5}$  of the ultimate resistance to compression,  $t$ , we effect both the numerator and the second term of the denominator, whereas, in (120), we only modify the numerator by taking  $\frac{1}{5}$  of the breaking load by formula.

To indicate how the "safe load" is effected by the empirical as compared with the rational method, the following values have been computed for certain ones of the columns in the principal table above.

	No.	$l$	$\frac{l}{k}$	For $\frac{1}{5}$ Column breaking load.	For $\frac{1}{5} t$ in (114)
Flat end	6	15	5.2	7080	7790
"	23	24	7.1	6540	7680
"	29	28	9.3	5860	7370
Rounded	16	20	8.5	4800	6320
"	36	34	12.	3960	5325

Here the last column of figures is to be regarded as truly representing the resistance of the columns, per square inch of section, when the maximum strain on the material of the column is only the fifth part of the breaking strain, while the column of figures preceding the last, usually regarded as the fifth part of the breaking load, does not strain the material to more than about one-seventh of its ultimate resistance. But fortunately this difference is on the safe side, so that the majority of existing columns in bridges are amply strong.

The figures in the last column are all less than 8000 lbs., the maximum strain assumed as allowable, that is, the fifth part of 40,000 lbs. The differences are to be considered as provisional, for preventing the strains rising in excess

of the 8000 lbs. by buckling or otherwise.

By taking  $\frac{1}{4}t$  in place of  $\frac{1}{2}t$  for computing the last column of figures, perhaps as close an agreement is obtained with the column preceding it as is possible with a simple fraction. From this fact it appears that the "factor of safety" usually employed for columns has been in the neighborhood of  $\frac{1}{4}$ , or that the working resistance of iron in columns has been from 5000 to 6000 lbs. per square inch, compression. But as a high value of the working resistance to compression is regarded by some prominent engineers as safer than a like high value for tension, it appears that columns have habitually been made unduly heavy.

#### SEMI-COLUMNS, WITH PIN ENDS AND COMPRESSION.

Perhaps this term will serve to distinguish pieces which are subject to longitudinal and transverse strains; as in Fig. 2, or in Fig. 28 and following.



Figure 28.

An expression for the max. strain in the section at A, Fig. 28, is obtained by combining Eq. (8) with (25) and eliminating M. Whence

$$t = \frac{Thd_1}{I \cos nt} \pm \frac{T}{K} \quad (124).$$

$$\left. \begin{aligned} \text{where } n^2 &= \frac{T}{\epsilon I} = \frac{t'K}{\epsilon I} = \frac{t'}{\epsilon k^2} \\ \text{also } \frac{T}{K} &= t', \text{ and } \frac{T}{I} = \frac{t'}{k^2} \end{aligned} \right\} \quad (124a).$$

These quantities may, indeed, be introduced with probable greater convenience for application, giving

$$\frac{t}{t'} = \frac{hd_1}{k^2 \cos \frac{l}{k} \sqrt{\frac{t'}{\epsilon}}} \pm 1 \quad (125).$$

the + sign being used to obtain the max. compressive strain, and the - sign for the max. tensile strain. The piece will fail from the first or second, as depending on the nearest approach of that strain to the modulus of crushing or of rupture. For wrought iron the + sign should be used, while for cast iron, except when  $h$  and  $l$  are very short, the - sign. The max. strain per square inch is  $t$ , tension or compression as just indicated, while  $t'$  is the actual average compressive force which is applied to the semi-column per square inch of the cross section. For instance, if the section be 10 square inches and the compressive force applied be 100,000 lbs.,  $t = 10,000$  lbs. But the max.  $t'$  resulting strain in the semi-column may be  $t = 30,000$  lbs. per square inch. Also  $h$  is the distance from the center of gravity of the end cross section to where the compressive load is applied;  $d_1$  the distance from the center of gravity of the middle section to the side, concave or convex, where the strain  $t$  is reckoned;  $k$  the radius of gyration of cross section;  $l$  the length of semi column, and  $\epsilon$  the coefficient of elasticity.

When  $d_1$  is taken on the convex side, and the 1st term  $2d$  member = 1, we will have tension  $t = 0$ .

Though a direct determination of  $t$  is effected for an assumed value of  $t'$ , yet the converse will doubtless most frequently be desired, but cannot be obtained by a direct simple solution. A few trial values of  $t'$  however will give a sufficiently close value for  $t$ .

For a case like Fig. 29 it is only necessary to put  $\frac{l}{2}$  instead of  $l$  in (125); whence, for  $AB = l$ ,  $AC = h$ , and for pin bearings at C and D,



Figure 29.

$$\frac{t}{t'} = \frac{hd_1}{k^2 \cos \frac{l}{2k} \sqrt{\frac{t'}{\epsilon}}} \pm 1 \quad (126).$$

If there be a load,  $P$ , at the middle of the semi-column, acting transversely and downward in Fig. 29, a suitable expression



is obtained by substituting  $M$  from (23) in (8), observing that for (23),  $l$  and  $P$  should be changed to  $\frac{l}{2}$  and  $\frac{P}{2}$  and that the essential sign of  $M$  is  $-$ .

Hence, for pin bearings, and a load  $P$  at the middle

$$t = \frac{d_1}{I} \left( \frac{P}{2n} \tan n \frac{l}{2} + \frac{Th}{\cos n \frac{l}{2}} \right) \pm \frac{T}{K} \quad \dots (127).$$

in which  $I$  = the principal moment of inertia of the cross section  $K$ ,  $T$  the whole compressive force applied, and  $n$  as given above.  $P$  is  $-$  for acting upward.

In order that the flexural moment at the middle of the semi-column be zero, the parenthesis should be zero. Whence

$$h = -\frac{P}{2nT} \sin n \frac{l}{2} \quad \dots (128).$$

This value of  $h$  is expected to be negative, and it implies that when  $P$  acts downward in Fig. 29, the arms  $h=BD=AC$  must be laid off downward.

This equation is applicable to upper chords of deck bridges which carry a floorbeam at the middle of each panel, and for determining the position of the pin bearing such that the max. load shall only cause compressive strain in the middle of the panel length. The chord should however be considerably heavier than as thus determined.

By making  $h=0$  in (127), we obtain the expression for a column with pin bearings against the middle of which there exists the lateral thrust  $P$ , viz:

$$= \frac{Pd_1}{2nI} \tan n \frac{l}{2} \pm \frac{T}{K} \quad \dots (129).$$

In deck bridges where numerous floor beams rest on each panel length of the upper chord, as is sometimes the case with wooden floor beams on iron trusses, we have each panel length serving like a column under cross loading, the latter being nearly uniformly distributed.

An expression for such a case is obtained from (35) and (8). Hence for pin bearings

$$t = \frac{wd_1}{n^2 I} \tan n \frac{l}{4} \tan n \frac{l}{2} \pm \frac{T}{K} \quad \dots (130).$$

$$= \frac{wd_1}{n^2 I} \left( \sec n \frac{l}{2} - 1 \right) \pm \frac{T}{K}$$

where  $w$  is the loading per unit length.

#### With Fixed Ends and Compression.

—Where the semi-column is fixed at the ends, as in continuous upper chords, combine (77) with (8) for a load  $P$  at the middle; whence

$$t = \frac{Pd_1}{2nI} \tan n \frac{l}{4} \pm \frac{T}{K} \quad \dots (131).$$

which gives the strain at either the middle or end of the panel length.

For a uniformly distributed load,  $w$ , for unit length, and for continuous upper chords, we have by (78) and (8)

$$t = \frac{wd_1}{n^2 I} \left( 1 - n \frac{l}{2} \cot n \frac{l}{2} \right) \pm \frac{T}{K} \quad \dots (132).$$

for the end of the panel length, and where the strain  $t$  is greatest.

At the middle we will have from  $x = \frac{l}{2}$  in (75) and (8)

$$t = \frac{wd_1}{n^2 I} \left\{ \frac{n \frac{l}{2}}{\sin n \frac{l}{2}} - 1 \right\} \pm \frac{T}{K} \quad \dots (133).$$

These formulas for distributed loads apply to account for the strain due to the weight of the parts, themselves, as in upper chords of through bridges; and the inclined end posts. In the latter however gravity acts with a transverse component only, which is considerably less than where the piece is horizontal.

Other cases, such as for one pin bearing and one fixed end, is provided for in (63), (64), (65) and (8), two floor beams and pin bearings in (49), &c., &c.

*Pin Bearings and Tension.*—In lower



Figure 30.

where the longitudinal force is tension, chords of bridges and other cases

we may combine (20) with (8), and obtain an expression adapted to Fig. 30. viz:

$$t = \frac{d_1}{I} \cdot \frac{2Th}{e^{\frac{nl}{2}} + e^{-\frac{nl}{2}}} \pm \frac{T}{K} \quad (134),$$

where  $l = AB$ , and  $h = BC$ . Here  $d_1$  will usually be measured on the convex side of beam, and where the + sign will generally be required. Also  $t$  will probably always be tension.

The formula for Fig. 31, will be obtained by replacing  $l$  in (134) by  $\frac{l}{2}$ , giving for pin bearings at C and D,

$$t = \frac{d_1}{I} \cdot \frac{2Th}{e^{\frac{n\frac{l}{2}}{2}} + e^{-\frac{n\frac{l}{2}}{2}}} \pm \frac{T}{K} \quad (135).$$

in which  $l = AB$ , and  $h = AD = BC$ .



Figure 31.

When a load is applied at the middle, acting downward, we have, by aid of (19) and (8), observing that  $P$  in (19) is the half of  $P$  here,

$$t = \frac{Pd_1 \left( e^{\frac{n\frac{l}{2}}{2}} - e^{-\frac{n\frac{l}{2}}{2}} \right) - 2Th}{2nI \left( e^{\frac{n\frac{l}{2}}{2}} + e^{-\frac{n\frac{l}{2}}{2}} \right)} \pm \frac{T}{K} \quad (136).$$

In order that the flexural moment at the middle of the beam shall be zero, the 1st term, 2d member, should be zero, which condition determines  $h$ .

Also  $h$  may be zero for a link or eye bar.

For a uniformly distributed load of  $w$  per unit length, we have for pin bearings

$$t = \frac{wd_1}{n^2 I} \left\{ 1 - \frac{2}{e^{\frac{n\frac{l}{2}}{2}} + e^{-\frac{n\frac{l}{2}}{2}}} \right\} \pm \frac{T}{K} \quad (137).$$

**Fixed Ends and Tension.**—For fixed ends we may combine (72) and (8) for a load at the middle, and for a distributed load (73); and these give strains at the end of the panel length. For the middle employ (74).

Other cases may readily be provided for. For instance, for two floor beams

to the panel length, the same resting on the lower chord, use (43) for ends in pin bearings.

For one pin bearing and one fixed end we have (68) and (69), &c., &c. The value of  $M$  found from any of these equations may be introduced in eq. (8) to the end of obtaining the maximum strain  $t$ , either tension or compression. Equivalents expressed in (124a) are applicable in all.

**Examples of Strains in Semi-Columns.**—The following examples have been worked to indicate the use of the formulas.

Take a wrought iron end post, or a panel length of an upper chord, length 20 feet, constructed as shown in Fig. 32.

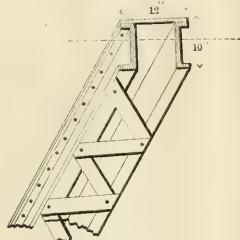


Figure 32.

of two 10'' channel bars of  $\frac{1}{2}'' \times 2\frac{1}{2}''$  flanges  $\times \frac{3}{8}''$  web; a plate  $12'' \times \frac{3}{8}''$ , and slats, all riveted together as shown. At the ends, proper thickening pieces, gussets, &c., are supposed in use.

Results for the section, with moment of inertia as dotted, are exclusive of latticing,

$K = \text{section} = 12.875 \text{ sq. in.}$

$I = 205$ , axis 3'' from plate.

$k^2 = 15.93 \text{ in.} = \text{radius of gyration.}$

$d_1 = 3.36 \text{ in.}$  plate side.

" = 7. " opposite side.

$w = \text{wt. per inch length } 3.6 \text{ lbs.}$

As a vertical column with knife bearings or pins without friction at center of gravity of sec. and with a max. strain of 10,000 lbs. per square inch, the resistance by new formula = 9011 lbs. for each inch of section.

As a horizontal column with latticing downward, knife bearings, &c., its weight, causes an additional strain of 459 lbs. per

square inch, as per first member of eq. (130). This is to be added to  $\frac{T}{K} =$  either the 10,000 or 9,011 lbs., according to whether the former or latter is to be regarded as the strain per square inch without flexure. The difference between these figures is the provisional excess mentioned under "factors of safety," and is peculiar to columns. This excess should grow rapidly less as we change from partially indifferent column-like strains to positive moments, such as provided for in eqs. (124) and (126).

The strain computed from the ordinary formula for a beam supported at its ends, its weight being the load, and  $T = 0$ , is 404. lbs., a quantity less than the above, as it should be.

We observe that the strain due to the uniform load  $w$  is, by eq. (130) directly proportional to  $w$  when  $T$  is constant, so that if this load be increased to 40 lbs. per inch or 480 lbs. per ft., the strain will be increased to 5,559 lbs. per sq. in.; while by the ordinary formula, ignoring  $T$ , it is 4,894 lbs. As an end post inclined at  $60^\circ$  with the horizon the strains will be reduced by a half.

Next, let the loading be  $P$  at the middle, of 1,000 lbs., with  $T$  and other data as before. As a column in pin bearings, Eq. (127), with  $h = 0$ , gives for the strain due to  $P$  1,090. lbs. per sq. in. By the ordinary formula it is 985.

Transferring the pins to the top of end sections, other conditions as in the last, then  $h = 3.36$  in. in (127), and the strain due to 1st term of 2d member of (127) is  $1090 + 578 = 1668$ .

To find where to place the pins so that the moment of strain and the middle shall be zero, we have from (128)  $h = -6.34$  inches, which is within  $\frac{2}{3}$  of an inch of the bottom.

As a last example, let the aggregate section of an iron lower chord be 4" breadth by 5 inches depth. Let the ends be fixed, as when continuous and clamped at the panel points. Let the panel length carry two floor beams, each with center 18" from panel point. Suppose the severest strain be due to the drive wheels, and when one pair rests directly on one of the floor beams. Then the other wheels will probably not rest on the other floor beam for unequal spacing. To simplify the work, find the effective load on

the floor beam directly under the pair of drive wheels, and let it amount to 23,560 lbs. =  $Q$ . Also take the point of contrary flexure near the other floor beam as a point of support. This places the chord in the condition of a beam fixed at one end, supported at the other, and having a load applied at 18" from the fixed end. Take the beam thus conditioned at  $l = 129.6''$  and let  $T = 88,000$  lbs.,  $\epsilon = 24,000,000$ . Then,

$$\frac{T}{\epsilon I} = .000088 = n^2 \quad n = .009381$$

$$nl = 1.2158 \quad na = 0.16886$$

$$n(l-a) = 1.0469$$

$$e^{nl} = 3.3729$$

$$e^{-nl} = .2965$$

$$e^{na} = 1.1839$$

$$e^{-na} = .8446$$

$$e^{n(l-a)} = 2.8489$$

$$e^{-n(l-a)} = .3510$$

Then by (69)

$$\frac{P}{Q} = .02968$$

The maximum strain is at the fixed end, where  $x$  and  $y = 0$ . Hence, the first member of 68, by aid of  $P$  from above, gives

$$M = Qa - Pl = 14.153 \quad Q = 333500.$$

$$\text{also } \frac{T}{K} = \frac{88000}{20} = 4400,$$

These in eq. 8 give the max. strain per square inch desired,

$$t = \frac{2.5}{41.67} 333500 + 4400 = 24405 \text{ lbs.}$$

The ordinary formulas for the same case and data, computing the parts separately and adding give

$$t = 24800 \text{ lbs.}$$

\* The formula of Tredgold is given in Tredgold on the *Strength of Cast Iron and Other Metals*, 2d ed., page 183, formula XIV.; and is

$$w = \frac{15300 bd^3}{a^2 + 18 l^2}$$

which is readily written in the form

$$w = \frac{15300 bd}{1 + 18 \frac{l^2}{a^2}}$$

where  $bd$  is the section of the column, =  $S$ , or  $K$ ; and  $l$  the length.

Tredgold gives credit for mathematical work to Dr. Young.

This is precisely the formula usually called Gordon's, but it appears to be due to other authors, even to the determination of the empirical constants for at least one case, probably cast iron, as appears from the formula as just quoted. But there can be no doubt of Gordon having determined the constants for this formula for a variety of materials, though there may be reasonable doubts of his being justly entitled to the credit usually accorded to him for the formula as a whole, and much more so for Rankine's modification of it where the radius of gyration is introduced.



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$$\begin{aligned} \frac{T}{\epsilon I} &= .000088 = n^2 & n &= .009381 \\ n l &= 1.2158 & n a &= 0.16886 \\ n(l-a) &= 1.0469 \\ e^{n l} &= 3.3729 & e^{-n l} &= .2965 \\ e^{n a} &= 1.1839 & e^{-n a} &= .8446 \\ e^{n(l-a)} &= 2.8489 & e^{-n(l-a)} &= .3510 \end{aligned}$$

Then by (69)

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**PRINCIPAL GRAIN MARKETS OF AMERICA: Showing their Growth and the Amount received by Each, Compared with the Total Product of the United States.**  
(Includes Flour Reduced to Wheat Bushels.)

Year.	Chicago.		Cincinnati (c).		St. Louis.		New Orleans.		Toledo.		Buffalo.		Philadelphia.		New York.		Baltimore (b).		Boston (b).		Montreal.		Milwaukee.		Kansas City.		Year.
	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	Receipts.	Per cent of the U. S. production.	
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1900	10,609										2,517,871															1900	
1901	10,609										2,517,871															1901	
1902	10,609										2,517,871															1902	
1903	10,609										2,517,871															1903	
1904	10,609										2,517,871															1904	
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1974	10,609										2,517,871															1974	
1975	10,609										2,517,871															1975	
1976	10,609										2,517,871															1976	
1977	10,609										2,517,871															1977	
1978	10,609																										



# INDEX,



## ERRATA.

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Page 99, line 16. Read "Anthracite Coal Combination," instead of "Atlantic Coal Combination."

Pages 319-333. Read "Cleveland, Mt. Vernon and Delaware" instead of "Columbus, Mt. Vernon, etc."

Page 416, line 21. Read  $\frac{\$41,629,500}{126} = \$330,393$  instead of  $\$41,629,500 = \$330,393$ , etc.

Page 420, third line from bottom. Read \$6,875 instead of \$68.75.

Page 433, second line from bottom. Read "Saxby and Farmer" instead of "Saxby and Former."

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# PLATE I.

## PLAN FOR THE PROTECTION OF RAILROAD CROSSINGS AT GRADE.

### SINGLE TRACK CROSSING.

#### Normal Condition.

Lever forward  
All Signals at Danger  
Switches W. X. Y. Z. set for  
Throw-off Sidings.

Distant Signal,  
1500 feet or more from  
Home Signal.

A train approaching from A. B. C. or D., upon reaching the corresponding Insulated section a. b. c. or d., will automatically ring an Electric Annunciator in the cabin to warn the operator, who can then either clear the corresponding Signals (1, 2), (3, 4), (5, 6), or (7, 8). If everything is right for the train to proceed over the crossing, or else he can stop the train by allowing the Signals to remain at danger.

Home Signal,  
400 feet or more from Crossing.

Insulated Section,  
1 mile or more from Crossing.

Distant Signal,  
1500 feet or more from Home Signal.

Home Signal,  
400 feet or more from Crossing.

Signals 1 and 2 clear, lock Switches W. and X. set for main line, Switches Y. and Z. set for throw-off sidings, and Signals 3, 4, 5, 6, 7, and 8 at danger.

Signals 3 and 4 clear, lock Switches W. and X. set for main line, Switches Y. and Z. set for throw-off sidings, and Signals 1, 2, 5, 6, 7, and 8 at danger.

Signals 5 and 6 clear, lock Switches Y. and Z. set for main line, Switches W. and X. set for throw-off sidings, and Signals 1, 2, 3, 4, 7, and 8 at danger.

Signals 7 and 8 clear, lock Switches Y. and Z. set for main line, Switches W. and X. set for throw-off sidings, and Signals 1, 2, 3, 4, 5, and 6 at danger.

Insulated Section,  
1 mile or more from Crossing.

5

H

6

LOCK

Y

6

LOCK

X

Y

5

H

6

LOCK

X

Y

5

H

6

LOCK

X

Y

5

H

6

LOCK

X

Y

5

H

6

LOCK

X

Y

5

H

6

LOCK

X

6 Lever Hydraulic  
Interlocking Machine.

SWITCH LOCK

1 Lever will operate Switches and Locks				W. and X.
1	"	"	"	Y. " Z.
1	"	"	"	1 " 2.
1	"	"	"	3 " 4.
1	"	"	"	5 " 6.
1	"	"	"	7 " 8.

Home Signal,  
400 feet or more from Crossing.

Distant Signal,  
1500 feet or more from Home Signal.

Insulated Section,  
1 mile or more  
from Crossing.

Home Signal,  
400 feet or more from Crossing.

Distant Signal,  
1500 feet or more from Home Signal.



Train from A has right of way.



Train from B has right of way.



Train from C has right of way.



Train from D has right of way.



# Normal Condition.

Switches W, X, Y, &

Throw-off Sidings

A train approaching from A, B, C, or D, upon reaching the corresponding insulated section a, b, c, or d, will automatically ring an Electric Annunciator in the cabin to warn the operator who can then clear the corresponding Signals (1, 2, 3, 4, 5, 6, 7, or 8), if everything is right for the train to proceed over the crossing, or else he can stop the train.

Signals 1 and 2 clear, lock Switches W, and X, set for main line, Switches Y, and Z, set for throw-off sidings, and Signals 3, 4, 5, 6, 7, and 8 at danger.  
Signals 3 and 4 clear, lock Switches W, and X, set for main line, Switches Y, and Z, set for throw-off sidings, and Signals 1, 2, 5, 6, 7, and 8 at danger.  
Signals 5 and 6 clear, lock Switches Y, and Z, set for main line, Switches W, and X, set for throw-off sidings, and Signals 1, 2, 3, 4, 7, and 8 at danger.  
Signals 7 and 8 clear, lock Switches Y, and Z, set for



Normal Condition.

All Signals

Throw-off

A train approaching from A, B, C or D, upon reaching corresponding Insulated section a, b, c or d, will automatically ring an Electric Annunciator in the cabin to warn the operator.

or (B) or (C, D) if everything is right for the train to pass; or else he can stop the train.

main line, Switches Y and Z set for throw-off  
Signals 3, 4, 5, 6, 7, and 8 at danger.  
Signals 3 and 4 clear, look Switches W and  
main line, Switches Y and Z set for throw-off, sidings, and  
Signals 1, 2, 3, 4, 5, 6, 7, and 8 at danger.  
Signals 5 and 6 clear, look Switches Y and Z set for main  
W and X set for throw-off, sidings, and Signal  
1, 2, 3, 4, 5, 6, 7, and 8 at danger.  
Signals 7 and 8 clear, look Switches Y and Z set for

# PLATE II.

## PLAN FOR THE PROTECTION OF RAILROAD CROSSINGS AT GRADE.

### DOUBLE TRACK CROSSING.

**Normal Condition.** { Levers forward  
All Signals at Danger  
Switches W. X. Y. Z. set for  
Throw-off Sidings.

*Insulated Section,  
1 mile or more  
from Crossing.*

A train approaching from A. B. C. or D., upon reaching the corresponding Insulated section a. b. c. or d., will automatically ring an Electric Annunciator in the cabin to warn the operator, who can then either clear the corresponding Signals (1, 2), (3, 4), (5, 6), or (7, 8), if everything is right for the train to proceed over the crossing, or else he can stop the train by allowing the Signals to remain at danger.

*Distant Signal,  
1500 feet or more  
from Home Signal.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

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400 feet or more from Crossing.*

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400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

CABIN

6 Lever Hydraulic Interlocking Machine.

SWITCH

SWITCH

SWITCH

SWITCH

SWITCH

SWITCH

SWITCH

SWITCH

SWITCH

SWITCH

SWITCH

SWITCH

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SWITCH

SWITCH

SWITCH

SWITCH

1	Lever will operate Switches and Locks	W. and X.
1	" " " " " " " "	Y. " Z.
1	" " " " " " " "	" " 3.
1	" " " " " " " "	" " 4.
1	" " " " " " " "	" " 5.
1	" " " " " " " "	" " 6.
1	" " " " " " " "	" " 7.
1	" " " " " " " "	" " 8.

*Home Signal,  
400 feet or more from Crossing.*

*Distant Signal,  
1500 feet or more from Home Signal.*

*Insulated Section.*

*1 mile or more from Crossing.*

*Home Signal,  
400 feet or more from Crossing.*

*Train from A has right of way.*

*Train from B has right of way.*

*Train from C has right of way.*

*Train from D has right of way.*

*Train from A and B have right of way.*

*Train from C and D have right of way.*

*Train from A has right of way.*

*Train from B has right of way.*

*Train from C has right of way.*

*Train from D has right of way.*

*Train from A and B have right of way.*

*Train from C and D have right of way.*

*Train from A has right of way.*

*Train from B has right of way.*

*Train from C has right of way.*

*Train from D has right of way.*

*Train from A and B have right of way.*

*Train from C and D have right of way.*

*Train from A has right of way.*

*Train from B has right of way.*

*Train from C has right of way.*

*Train from D has right of way.*

*Train from A and B have right of way.*

*Train from C and D have right of way.*

*Train from A has right of way.*

*Train from B has right of way.*

*Train from C has right of way.*

*Train from D has right of way.*

*Train from A and B have right of way.*

*Train from C and D have right of way.*

*Train from A has right of way.*

*Train from B has right of way.*

*Train from C has right of way.*

*Train from D has right of way.*

Normal Condition

A train approaching from A. B. corresponding insulated section a, b, c, or d, ing an Electric Annunciator in the cabin to who can then clear the corresponding section (a, b, c, or d), if everything is over the crossing, or else he

7 and 8 at danger.  
 Signals 3 and 4 clear, lock Switch X, set 6  
 Signals 1 and 2, set for throw-off sidings and  
 7 and 8 at danger.  
 Signals 5 and 6 clear, lock Switch Y.  
 Switches W and X set for throw-off sidings.

# LOCKING JUNCTION.

Home Signal 1

Locking Cabin

Lever for

Normal Condition.

Throw-on Signal

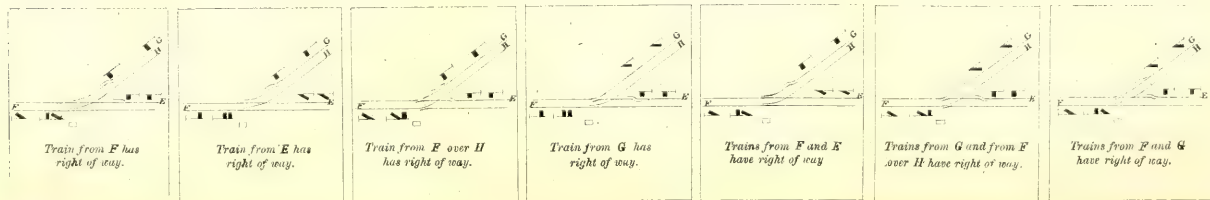
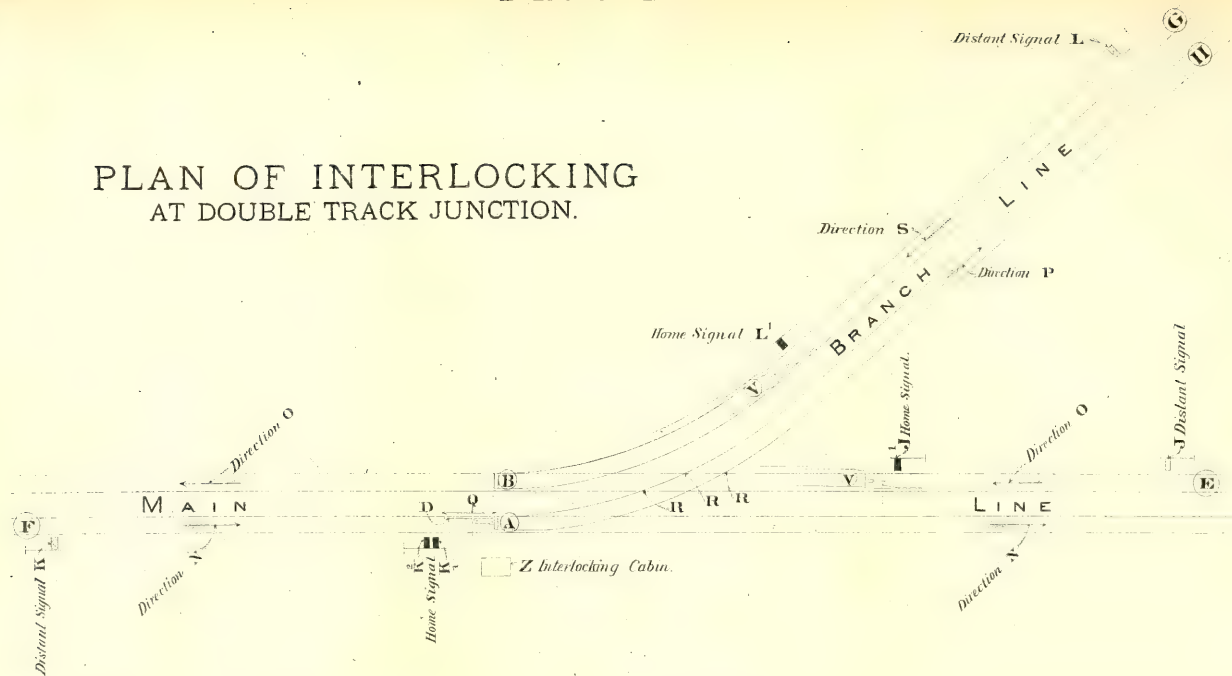
A train approaching from A, B, C or D, upon a corresponding insulated section a, b, c or d, will not who can then either clear the corresponding Signal (a, b, c or d), or (7, 8), if everything is right for the train.



Signals 3 and 4 clear, look Switches Y and Z, set for the

Signals 5 and 6 clear, look Switch

# PLAN OF INTERLOCKING AT DOUBLE TRACK JUNCTION.





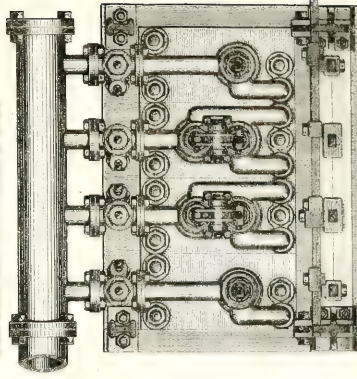
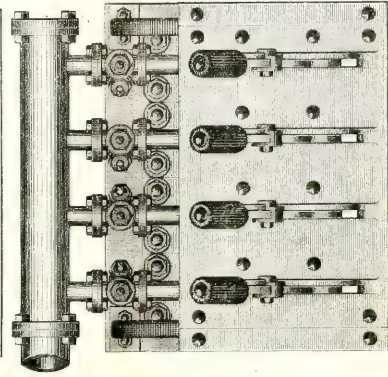
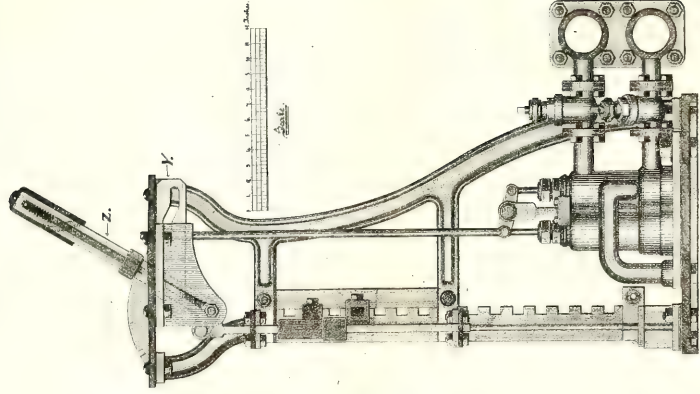
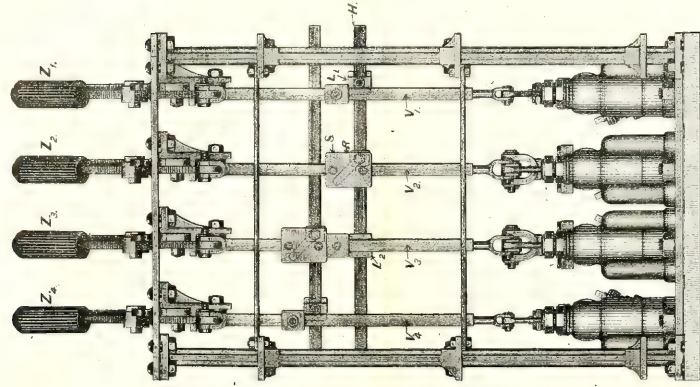
# PLAN OF INTER- AT DOUBLE TRACK



PLATE IV.

# PLAN OF INT AT DOUBLE TRACK





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二、  
三、  
四、  
五、  
六、  
七、  
八、  
九、  
十、

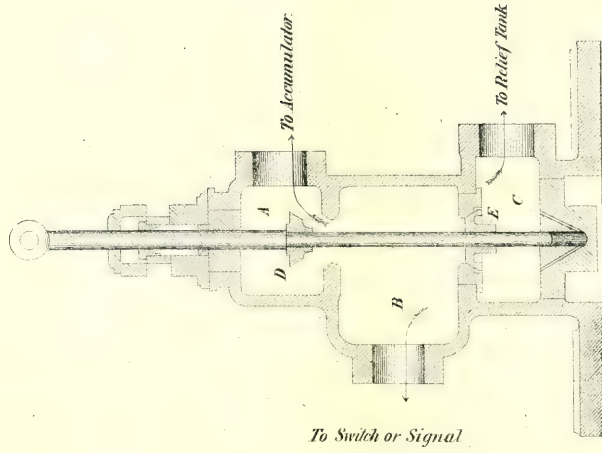
十一、  
十二、  
十三、  
十四、  
十五、  
十六、  
十七、  
十八、  
十九、  
二十、

PLATE V.

НИКОЛАЙ ПЕТРОВИЧ ПУШКИНЪ  
ИЗЪ ПИСЬМА КЪ А. С. ПУШКИНЪ







THREE WAY VALVE  
FOR  
HYDRAULIC INTERLOCKING MACHINE.



# STRESS WAY VALVE

BRILL &

PLATE VI.

THE WYATT  
PUMP MACHINE

WYATT

*To Interlocking  
Machine Valve.*

HYDRAULIC SWITCH APPARATUS,  
WITH SIGNAL VALVE ATTACHED.















